Name: Student No.:

prof_h_abujabal@yahoo.com prof.h.abujabal@hotmail.com

1. $\lim_{x\to\infty}\frac{2x^4+5}{3x^3+x-1}=$

$\boxed{A}$ ∞ $\boxed{B}$ $\frac{2}{3}$ $\boxed{C}$ 0 $\boxed{D}$ $-\infty$

2. $\lim_{x\to\infty}\frac{2x^2+5}{3x^3+x-1}=$

$\boxed{A}$ ∞ $\boxed{B}$ $\frac{2}{3}$ $\boxed{C}$ 0 $\boxed{D}$ $-\infty$

3. $\lim_{x\to\infty}\frac{2x^3+5}{3x^3+x-1}=$

$\boxed{A}$ ∞ $\boxed{B}$ $\frac{2}{3}$ $\boxed{C}$ 0 $\boxed{D}$ $-\infty$

4. $\lim_{x\to\infty}\frac{-2x^4+5}{3x^3+x-1}=$

$\boxed{A}$ ∞ $\boxed{B}$ $\frac{2}{3}$ $\boxed{C}$ 0 $\boxed{D}$ $-\infty$

5. $\lim_{x\to 0}\frac{\tan|x|}{x}=$

$\boxed{A}$ 1 $\boxed{B}$ does not exist $\boxed{C}$ 0 $\boxed{D}$ -1

6. $\lim_{x\to 0^+}\frac{\tan|x|}{x}=$

$\boxed{A}$ 1 $\boxed{B}$ does not exist $\boxed{C}$ 0 $\boxed{D}$ -1

7. $\lim_{x\to 0^-}\frac{\tan|x|}{x}=$

$\boxed{A}$ 1 $\boxed{B}$ does not exist $\boxed{C}$ 0 $\boxed{D}$ -1

8. If $\lim_{x\to-\infty}\frac{\sqrt{4x^2-x+2}}{x+3}=$

$\boxed{A}$ 2 $\boxed{B}$ -2 $\boxed{C}$ -4 $\boxed{D}$ does not exist

9. $\lim_{x\to\infty}(4x-\sqrt{16x^2+3x})=$

$\boxed{A}$ 0 $\boxed{B}$ $-\frac{3}{8}$ $\boxed{C}$ $\frac{3}{8}$ $\boxed{D}$ does not exist

10. $\lim_{x\to\infty}\sqrt{16x^2+3x}-4x)=$

$\boxed{A}$ 0 $\boxed{B}$ $-\frac{3}{8}$ $\boxed{C}$ $\frac{3}{8}$ $\boxed{D}$ does not exist

11. $\lim_{x\to\infty}(\sqrt{x^2+6x+2}-x)$ is:

$\boxed{A}$ -3 $\boxed{B}$ 6 $\boxed{C}$ 3 $\boxed{D}$ does not exists

12. $\lim_{x\to 3}\sqrt[3]{10-2x^2}$ is:

$\boxed{A}$ 2 $\boxed{B}$ -2 $\boxed{C}$ ± 2 $\boxed{D}$ does not exists

13. $\lim_{x\to-\infty}\dfrac{\sqrt{16x^2-5}}{x+3}$ is:

$\boxed{A}$ 4 $\boxed{B}$ -4 $\boxed{C}$ ± 4 $\boxed{D}$ does not exists

14. The function $f(x)=\dfrac{x+3}{x^2-49}$ is:

$\boxed{A}$ continuous on $\mathbb{R}$ $\boxed{B}$ not continuous at $x=\pm 7$

$\boxed{C}$ not continuous at $x=-3$ $\boxed{D}$ continuous on $\{\pm 7\}$

15. $\lim_{x\to 1}\dfrac{x^3-1}{x-1}$ is:

$\boxed{A}$ $\dfrac{1}{3}$ $\boxed{B}$ 0 $\boxed{C}$ does not exists $\boxed{D}$ 3

16. $\lim_{x\to 0}\dfrac{3x}{\sqrt{x+9}-3}=$

$\boxed{A}$ 0 $\boxed{B}$ -18 $\boxed{C}$ 18 $\boxed{D}$ does not exist

17. $\lim_{x\to 0}\dfrac{3x}{3-\sqrt{x+9}}=$

$\boxed{A}$ 0 $\boxed{B}$ -18 $\boxed{C}$ 18 $\boxed{D}$ does not exist

18. $\lim_{x\to -4}\dfrac{3x+12}{x^2+x-12}$ is:

$\boxed{A}$ $-\dfrac{3}{7}$ $\boxed{B}$ 0 $\boxed{C}$ $\dfrac{3}{7}$ $\boxed{D}$ does not exists

19. $\lim_{x\to 2^+}\dfrac{1}{x-2}$ is:

$\boxed{A}$ ∞ $\boxed{B}$ $-\infty$ $\boxed{C}$ $\pm\infty$ $\boxed{D}$ 1

20. If $f(x)=\begin{cases} x^2-5 & ; x\le 3 \\ \sqrt{x+13} & ; x>3 \end{cases}$, then $\lim_{x\to 3} f(x)=$

$\boxed{A}$ ± 4 $\boxed{B}$ 4 $\boxed{C}$ -4 $\boxed{D}$ does not exist

21. If $x^2 - 1 \le f(x) \le 4\sqrt{x+1}$, then $\lim_{x \to 3} f(x) =$

[A] 2 [B] 9 [C] 8 [D] does not exist

22. $\lim_{x \to 0} \frac{2\tan(5x)}{\sin(3x)} =$

[A] $\frac{5}{3}$ [B] $\frac{6}{5}$ [C] $\frac{10}{3}$ [D] does not exist

23. $\lim_{x \to 0} \frac{|x|}{x} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

24. $\lim_{x \to 0^+} \frac{|x|}{x} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

25. $\lim_{x \to 0^-} \frac{|x|}{x} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

26. $\lim_{x \to 1} \frac{|x-1|}{x-1} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

27. $\lim_{x \to 1^+} \frac{|x-1|}{x-1} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

28. $\lim_{x \to 1^-} \frac{|x-1|}{x-1} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

29. $\lim_{x \to 1} \frac{|x-1|}{1-x} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

30. $\lim_{x \to 1^+} \frac{|x-1|}{1-x} =$

[A] 0 [B] 1 [C] –1 [D] does not exist

31. $\lim_{x \to 1^-} \frac{|x-1|}{1-x} =$

[A] 0 [B] 1 [C] −1 [D] does not exist

32. $\lim_{x \to 0} (\frac{1-\cos^2 x}{2x})$ is:

[A] does not exist [B] 0 [C] 2 [D] $\frac{1}{2}$

33. $\lim_{x \to 0} (\frac{1-\cos^2 x}{1-\cos x})$ is:

[A] does not exist [B] 0 [C] 2 [D] $\frac{1}{2}$

34. The vertical asymptote of the graph of $f(x) = \frac{\sqrt{9x^2+1}}{x-9}$ is :

[A] $x = \pm 3$ [B] $y = \pm 3$ [C] $y = 9$ [D] $x = 9$

35. The Horizontal asymptote of the graph of $f(x) = \frac{\sqrt{9x^2+1}}{x-9}$ is :

[A] $x = \pm 3$ [B] $y = \pm 3$ [C] $y = 9$ [D] $x = 9$

36. $\lim_{x \to 5^+} \frac{1-3x}{x-5} =$

[A] ∞ [B] $-\infty$ [C] $\pm\infty$ [D] 0

37. $\lim_{x \to 5^+} \frac{1-3x}{x-5} =$

[A] ∞ [B] $-\infty$ [C] $\pm\infty$ [D] 0

38. The value k makes $f(x) = \begin{cases} 7x-2 & ; x \le 1 \\ kx^2 & ; x > 1 \end{cases}$ continuous at $x = 1$ is

[A] 5 [B] − 5 [C] $\sqrt{5}$ [D] 0

39. $\lim_{x \to 0} \frac{8x^2}{4-4\cos^2 x} =$

[A] 1 [B] 0 [C] does not exist [D] 2

40. $\lim_{x \to 3} (\frac{1}{x-3} - \frac{6}{x^2-9})$ is:

[A] ∞ [B] 0 [C] 6 [D] $\frac{1}{6}$

King Abdul Aziz University Faculty of Sciences Mathematics Department
Second Test Fall 2008 Math 110 Time: 90 Minutes A
Name : ID No.:

1) $\lim_{x \to -1} (3x^3 - x + 2) =$

[A] 0 [B] 3 [C] does not exist [D] -2

2) $\lim_{x \to 1} \frac{x^2 - 5x + 4}{x - 2} =$

[A] -1 [B] does not exist [C] ∞ [D] 0

3) $\lim_{x \to 3} \frac{x - 2}{x^2 - 5} =$

[A] ∞ [B] does not exist [C] $\frac{1}{4}$ [D] -2

4) $\lim_{x \to 5} \frac{x - 5}{x^2 - 25} =$

[A] 10 [B] $\frac{1}{10}$ [C] does not exist [D] 0

5) $\lim_{x \to 2} \frac{x^3 - 8}{x - 2} =$

[A] 12 [B] $\frac{1}{12}$ [C] does not exist [D] 0

6) $\lim_{x \to 1} \sqrt[3]{x^2 - 9} =$

[A] ± 2 [B] 2 [C] does not exist [D] -2

7) $\lim_{x \to 0} \frac{\sqrt{x + 2} - \sqrt{2}}{x} =$

[A] $2\sqrt{2}$ [B] $\frac{1}{\sqrt{2}}$ [C] $\frac{1}{2\sqrt{2}}$ [D] does not exist

8) $\lim_{x \to 0} \frac{x^2 - 5x}{x} =$

[A] ∞ [B] 0 [C] does not exist [D] -5

9) $\lim_{x \to \frac{\pi}{4}} \sin(x) =$

[A] $\frac{\sqrt{2}}{2}$ [B] 0 [C] does not exist [D] $\frac{1}{2}$

10) $\lim_{x\to 3}\frac{x^2-x-6}{x-3}=$

[A] ∞ [B] 1 [C] does not exist [D] 5

11) If $f(x)=\begin{cases}2\cos x & ;x\geq 0\\ x & ;x<0\end{cases}$, then $\lim_{x\to 0} f(x)=$

[A] 0 [B] 2 [C] does not exist [D] -2

12) $\lim_{x\to -3}\frac{x+3}{x^3+27}=$

[A] $\frac{1}{27}$ [B] 27 [C] does not exist [D] $\frac{1}{9}$

13) The function $f(x)=\frac{x-5}{x^2-5x+6}$ is discontinuous at

[A] $-3,-2$ [B] $2,3$ [C] $-1,6$ [D] $-6,1$

14) $\lim_{x\to 3^+}\frac{-2}{x-3}=$

[A] ∞ [B] $\pm\infty$ [C] $-\infty$ [D] 0

15) $\lim_{x\to\infty}\frac{6x^3-x}{-2x^3-3}=$

[A] ∞ [B] 0 [C] 3 [D] -3

16) If $y=-2x^3-5x+4$, then $y'=$

[A] $6x^2-5$ [B] $-6x^2-5$ [C] $-6x^2+5$ [D] $-2x^2+3x-5$

17) If $y=\frac{2}{x^5}$, then $y'=$

[A] $-\frac{10}{x^4}$ [B] $-\frac{10}{x^6}$ [C] $\frac{5}{x^6}$ [D] $\frac{10}{x^6}$

18) If $y=\frac{x-1}{x+1}$, then $y'=$

[A] $2(x+1)^{-2}$ [B] $2(x+1)^2$

[C] $(x+1)^{-2}$ [D] $-2(x+1)^{-2}$

19) If $f(x)=\dfrac{x-1}{x+1}$, then $f'(3)=$

[A] $-\dfrac{1}{8}$ [B] $\dfrac{1}{8}$ [C] $\dfrac{1}{16}$ [D] $\dfrac{1}{4}$

20) The tangent line of $f(x)=x^3-3$ at $(1,-2)$ is

[A] $y=x-3$ [B] $y=3x+5$ [C] $y=3x-5$ [D] $y=x-1$

21) If $y=\sqrt{2x^3-x^2}$, then $y'=$

[A] $\dfrac{x(3x-1)}{2\sqrt{2x^3-x^2}}$ [B] $\dfrac{3x-1}{\sqrt{2x^3-x^2}}$ [C] $\dfrac{3x-1}{2\sqrt{2x^3-x^2}}$ [D] $\dfrac{x(3x-1)}{\sqrt{2x^3-x^2}}$

22) The function $f(x)=\sqrt{4-x^2}$ is continuous on

[A] $(-\infty,\infty)$ [B] $[-2,2]$ [C] $(-2,2]$ [D] $[-2,2)$

23) If $y=(x^4-5)^7$, then $y'=$

[A] $28(x^4-5)^6$ [B] $28x^3(x^4-5)^6$ [C] $28x^3(x^4-5)^8$ [D] $7x^3(x^4-5)^6$

24) If $y=x^5+3x^2-1$, then $y^{(5)}=$

[A] 0 [B] $60x^2$ [C] 120 [D] $120x$

25) If $y=(x^2-1)(x^3+2)$, then $y'=$

[A] $5x^4-3x^2+4x$ [B] $5x^4-3x^2$

[C] $5x^4+3x^2+4x$ [D] $3x^4-3x^2+4x$

26) If $y=\dfrac{x^4-3x^2}{x}$, then $y'=$

[A] $3(x^2-2)$ [B] $3x(x-1)$ [C] $3(x^2-1)$ [D] $3(x^3-1)$

27) $\lim\limits_{x\to 1^-}\dfrac{2|x-1|}{1-x}=$

[A] 1 [B] 2 [C] -2 [D] does not exist

28) If $(x-5)\le f(x)\le\sqrt{x+1}$, then $\lim\limits_{x\to 8} f(x)=$

[A] -3 [B] ∞ [C] does not exist [D] 3

29) If $y=x\sqrt{x}$, then $y'=$

[A] $\dfrac{2}{3}\sqrt{x}$ [B] $\dfrac{3}{2}\sqrt[3]{x}$ [C] $\dfrac{3}{2}\sqrt{x}$ [D] $-\dfrac{3}{2}\sqrt{x}$

30) If $y = \pi^2$, then $\frac{dy}{dx} =$

[A] 0 [B] π^3 [C] 2π [D] π

Q4 Name: Student No.:

[A] prof_h_abujabal@yahoo.com prof.h.abujabal@hotmail.com

1) The tangent line equation at $(1,3)$ for the curve of $f(x) = x^2 + 2$ is

[A] $y = 2x + 1$ [B] $y = 2x - 5$ [C] $y = 2x - 1$ [D] $y = 2x + 2$

2) If $y = \sqrt{3x^2 + 7}$, then y' is:

[A] $y' = 6x\sqrt{3x^2 + 7}$ [B] $y' = 3x\sqrt{3x^2 + 7}$

[C] $y' = \frac{3x}{\sqrt{3x^2 + 7}}$ [D] $y' = \frac{x}{2\sqrt{3x^2 + 7}}$

3) If $y = \cos(x^5)$, then y' is:

[A] $y' = 5x^4 \sin(x^5)$ [B] $y' = 5\sin^4(x)$

[C] $y' = -5x^4 \sin(x^5)$ [D] $y' = x^5 \sin x + 5x^4 \sin x$

4) If $y = \sec x \tan x$, then y' is:

[A] $y' = \sec x^3 + \sec x \tan^2 x$ [B] $y' = \sec^3 x + \sec x \tan^2 x$

[C] $y' = \sec^3 x + \sec x \tan x^2$ [D] $y' = \sec^3 x - \sec x \tan^2 x$

5) If $y = x^5 + x^{-2}$, then y' is:

[A] $y' = \frac{x^6}{6} - 2x^{-3}$ [B] $y' = 5x^4 + 2x^{-3}$ [C] $y' = 5x^4 - x^{-1}$ [D] $y' = 5x^4 - 2x^{-3}$

6) If $y = \frac{x}{x + 7}$, then y' is:

[A] $y' = 7x(x + 7)^{-2}$ [B] $y' = x(x + 7)^{-2}$

[C] $y' = -7(x + 7)^{-2}$ [D] $y' = 7(x + 7)^{-2}$

7) If $f(x) = x^{-1}$, then $f^{(n)}(x) =$

[A] $(-1)^n n! x^{-n+1}$ [B] $(-1)^{n+1} n! x^{-(n+1)}$ [C] $(-1)^n n x^{-(n+1)}$ [D] $(-1)^n n! x^{-(n+1)}$

8) $D^{99}(\cos x) =$

[A] $\sin x$ [B] $\cos x$ [C] $-\sin x$ [D] $-\cos x$

9) If $y = (x + \sec x)^3$, then y' is:

[A] $y' = 3(x + \sec x)^2(1 + \tan x)$ [B] $y' = 3(x + \sec x)^2(1 + \sec x \tan x)$

[C] $y' = (x + \sec x)^2(1 + \sec x \tan x)$ [D] $y' = \frac{1}{4}(x + \sec x)^4(1 + \sec x \tan x)$

10) If $x^2 = 5y^2 + \sin y$, then y' is:

[A] $y' = \dfrac{2}{10y + \cos y}$ [B] $y' = \dfrac{2x}{10y - \cos y}$

[C] $y' = \dfrac{2x}{10y + \cos y}$ [D] $y' = \dfrac{x}{5y + \cos y}$

Q4 Name: Student No.:

[B] prof_h_abujabal@yahoo.com prof.h.abujabal@hotmail.com

1) The tangent line equation at $(1,2)$ for the curve of $f(x) = 3x^2 - x$ is

[A] $y = 5x + 1$ [B] $y = 5x - 3$ [C] $y = 5x - 7$ [D] $y = 5x + 3$

2) If $y = \sqrt{5x^2 + 7}$, then y' is:

[A] $y' = 10x\sqrt{5x^2 + 7}$ [B] $y' = 5x\sqrt{5x^2 + 7}$

[C] $y' = \dfrac{5x}{\sqrt{5x^2 + 7}}$ [D] $y' = \dfrac{5x}{2\sqrt{5x^2 + 7}}$

3) If $x^2 = 5y^2 + \sin y$, then y' is:

[A] $y' = \dfrac{2}{10y + \cos y}$ [B] $y' = \dfrac{2x}{10y - \cos y}$

[C] $y' = \dfrac{2x}{10y + \cos y}$ [D] $y' = \dfrac{x}{5y + \cos y}$

4) If $y = \sin x \sec x$, then y' is:

[A] $y' = \sin x \tan x + \cos x \sec x$ [B] $y' = \sin x \sec x \tan x + \cos x \sec x$

[C] $y' = \sin x \tan x - \cos x \sec x$ [D] $y' = \sin x \sec x \tan x - \cos x \sec x$

5) If $y = x^6 + x^{-2}$, then y' is:

[A] $y' = \dfrac{x^7}{7} - 2x^{-3}$ [B] $y' = 6x^5 + 2x^{-3}$

[C] $y' = 6x^5 - x^{-1}$ [D] $y' = 6x^5 - 2x^{-3}$

6) If $y = \dfrac{x+1}{x+7}$, then y' is:

[A] $y' = 7x(x+7)^{-2}$ [B] $y' = 7(x+7)^{-2}$ [C] $y' = 8(x+7)^{-2}$ [D] $y' = 6(x+7)^{-2}$

7) If $f(x) = \sin^2(x^3 + 1)$, then :

[A] $f'(x) = 6x^2 \sin(x^3+1)\cos(x^3+1)$ [B] $f'(x) = 3x^2 \sin(x^3+1)\cos(x^3+1)$

[C] $f'(x) = -6x^2 \sin(x^3+1)\cos(x^3+1)$ [D] $f'(x) = 2x^2 \sin(x^3+1)\cos(x^3+1)$

8) If $y = (x + \cot x)^3$, then y' is:

[A] $y' = 3(x + \cot x)^2(1 + \csc^2 x)$ [B] $y' = 3(x + \cot x)^2(1 - \csc^2 x)$

C $y' = -3(x + \cot x)^2(1 - \csc^2 x)$ D $y' = (x + \cot x)^2(1 - \csc^2 x)$

9) If $f(x) = x^{-1}$, then $f^{(n)}(x) =$

A $(-1)^n n! x^{-n+1}$ B $(-1)^{n+1} n! x^{-(n+1)}$ C $(-1)^n n x^{-(n+1)}$ D $(-1)^n n! x^{-(n+1)}$

10) $D^{99}(\sin x) =$

A $\sin x$ B $\cos x$ C $-\sin x$ D $-\cos x$

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C prof_h_abujabal@yahoo.com prof.h.abujabal@hotmail.com

1) The tangent line equation at $(1,3)$ for the curve of $f(x) = x^2 + 2$ is

A $y = 2x + 1$ B $y = 2x - 5$ C $y = 2x - 1$ D $y = 2x + 2$

2) If $y = \sqrt{3x^2 + 7}$, then y' is:

A $y' = 3x\sqrt{3x^2 + 7}$ B $y' = 6x\sqrt{3x^2 + 7}$

C $y' = \dfrac{x}{2\sqrt{3x^2 + 7}}$ D $y' = \dfrac{3x}{\sqrt{3x^2 + 7}}$

3) If $y = \cos(x^5)$, then y' is:

A $y' = -5x^4 \sin(x^5)$ B $y' = x^5 \sin x + 5x^4 \sin x$

C $y' = 5x^4 \sin(x^5)$ D $y' = 5\sin^4(x)$

4) If $y = \sec x \tan x$, then y' is:

A $y' = \sec^3 x + \sec x \tan x^2$ B $y' = \sec^3 x - \sec x \tan^2 x$

C $y' = \sec x^3 + \sec x \tan^2 x$ D $y' = \sec^3 x + \sec x \tan^2 x$

5) If $y = x^5 + x^{-2}$, then y' is:

A $y' = 5x^4 - 2x^{-3}$ B $y' = 5x^4 - x^{-1}$ C $y' = 5x^4 + 2x^{-3}$ D $y' = \dfrac{x^6}{6} - 2x^{-3}$

6) If $y = \dfrac{x}{x + 7}$, then y' is:

A $y' = -7(x + 7)^{-2}$ B $y' = 7(x + 7)^{-2}$

C $y' = 7x(x + 7)^{-2}$ D $y' = x(x + 7)^{-2}$

7) If $f(x) = x^{-1}$, then $f^{(n)}(x) =$

A $(-1)^n n! x^{-(n+1)}$ B $(-1)^n n x^{-(n+1)}$ C $(-1)^{n+1} n! x^{-(n+1)}$ D $(-1)^n n! x^{-n+1}$

8) $D^{97}(\cos x) =$

A $\sin x$ B $\cos x$ C $-\sin x$ D $-\cos x$

9) If $y = (x + \sec x)^3$, then y' is:

A $y' = 3(x + \sec x)^2(1 + \sec x \tan x)$ B $y' = 3(x + \sec x)^2(1 + \tan x)$

C $y' = \frac{1}{4}(x + \sec x)^4(1 + \sec x \tan x)$	D $y' = (x + \sec x)^2(1 + \sec x \tan x)$

10) If $x^2 = 5y^2 + \sin y$, then y' is:

A $y' = \frac{2x}{10y - \cos y}$	B $y' = \frac{2}{10y + \cos y}$
C $y' = \frac{x}{5y + \cos y}$	D $y' = \frac{2x}{10y + \cos y}$

Q4 Name: Student No.:

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1) The tangent line equation at $(1,2)$ for the curve of $f(x) = 3x^2 - x$ is

A $y = 5x - 3$ B $y = 5x + 1$ C $y = 5x + 3$ D $y = 5x - 7$

2) If $y = \sqrt{5x^2 + 7}$, then y' is:

A $y' = \frac{5x}{\sqrt{5x^2 + 7}}$	B $y' = \frac{5x}{2\sqrt{5x^2 + 7}}$
C $y' = 10x\sqrt{5x^2 + 7}$	D $y' = 5x\sqrt{5x^2 + 7}$

3) If $x^2 = 5y^2 + \sin y$, then y' is:

A $y' = \frac{2x}{10y + \cos y}$	B $y' = \frac{x}{5y + \cos y}$
C $y' = \frac{2}{10y + \cos y}$	D $y' = \frac{2x}{10y - \cos y}$

4) If $y = \sin x \sec x$, then y' is:

A $y' = \sin x \sec x \tan x + \cos x \sec x$	B $y' = \sin x \tan x + \cos x \sec x$
C $y' = \sin x \sec x \tan x - \cos x \sec x$	D $y' = \sin x \tan x - \cos x \sec x$

5) If $y = x^6 + x^{-2}$, then y' is:

A $y' = 6x^5 - x^{-1}$	B $y' = 6x^5 - 2x^{-3}$
C $y' = \frac{x^7}{7} - 2x^{-3}$	D $y' = 6x^5 + 2x^{-3}$

6) If $y = \frac{x+1}{x+7}$, then y' is:

A $y' = 7x(x+7)^{-2}$ B $y' = 7(x+7)^{-2}$ C $y' = 8(x+7)^{-2}$ D $y' = 6(x+7)^{-2}$

7) If $f(x) = \sin^2(x^3 + 1)$, then :

A $f'(x) = -6x^2 \sin(x^3+1)\cos(x^3+1)$	B $f'(x) = 2x^2 \sin(x^3+1)\cos(x^3+1)$
C $f'(x) = 3x^2 \sin(x^3+1)\cos(x^3+1)$	D $f'(x) = 6x^2 \sin(x^3+1)\cos(x^3+1)$

8) If $y = (x + \cot x)^3$, then y' is:

[A] $y' = -3(x + \cot x)^2(1 - \csc^2 x)$ [B] $y' = (x + \cot x)^2(1 - \csc^2 x)$

[C] $y' = 3(x + \cot x)^2(1 + \csc^2 x)$ [D] $y' = 3(x + \cot x)^2(1 - \csc^2 x)$

9) If $f(x) = x^{-1}$, then $f^{(n)}(x) =$

[A] $(-1)^{n+1} n! x^{-(n+1)}$ [B] $(-1)^n n! x^{-n+1}$ [C] $(-1)^n n! x^{-(n+1)}$ [D] $(-1)^n n x^{-(n+1)}$

10) $D^{98}(\sin x) =$

[A] $\sin x$ [B] $\cos x$ [C] $-\sin x$ [D] $-\cos x$

CHAPTER 1 (LIMITS)

5. Evaluate $\lim_{x \to 4} \frac{x-6}{x^2+16}$

A) $-\frac{1}{16}$ B) –2 C) 32 D) does not exist

Ans: A Difficulty: Moderate Section: 1.3

24. Evaluate $\lim_{x \to 5} \sqrt{2x+5}$

A) 5 B) 15 C) $\sqrt{15}$ D) $4\sqrt{15}$

Ans: C Difficulty: Moderate Section: 1.3

25. Evaluate $\lim_{x \to 2} \frac{x^2+5x-14}{x^2-9x+14}$

A) 9 B) $-\frac{9}{5}$ C) 2 D) does not exist

Ans: B Difficulty: Moderate Section: 1.3

26. Evaluate $\lim_{x \to 5\pi/2} x^2 \cos x$

A) 0 B) 4 C) 1 D) does not exist

Ans: A Difficulty: Moderate Section: 1.3

27. Evaluate $\lim_{x \to 0^+} x^6 \sec^6 x$

A) 0 B) 1 C) $\frac{\pi}{2}$ D) does not exist

Ans: A Difficulty: Moderate Section: 1.3

28. Evaluate $\lim_{x \to 0} \frac{3x}{4-\sqrt{x+16}}$

A) 12 B) 24 C) –24 D) does not exist

Ans: C Difficulty: Moderate Section: 1.3

29. Evaluate $\lim_{x\to -1} f(x)$ where

$$f(x)=\begin{cases}3x^2+9 & \text{if } x<-1\\ 5x+9 & \text{if } x\geq -1\end{cases}$$

A) 0 B) 12 C) 4 D) does not exist
Ans: D Difficulty: Moderate Section: 1.3

30. Evaluate $\lim_{x\to 1} f(x)$ where

$$f(x)=\begin{cases}2x+1 & \text{if } x<-1\\ 3 & \text{if } -1<x<1\\ 2x+1 & \text{if } x>1\end{cases}$$

A) 3 B) 2 C) 1 D) does not exist
Ans: A Difficulty: Moderate Section: 1.3

31. Evaluate $\lim_{h\to 0}\dfrac{(3+h)^3-27}{h}$

A) 9 B) 27 C) 18 D) does not exist
Ans: B Difficulty: Moderate Section: 1.3

32. Evaluate $\lim_{x\to 0}\dfrac{\sqrt{x^2+x+25}-5}{x^2+x}$

A) $\dfrac{1}{10}$ B) 5 C) 25 D) does not exist
Ans: A Difficulty: Moderate Section: 1.3

33. Find the limit or explain why it does not exist.

$$\lim_{x\to 7^+}\sqrt{49-x^2}$$

A) 7
B) 0
C) The limit does not exist; the function increases without bound as *x* approaches 7 from the right.
D) The limit does not exist; the function is not defined for $x>7$.
Ans: D Difficulty: Moderate Section: 1.3

34. Find the limit or explain why it does not exist.

$$\lim_{x\to 2^-}\sqrt{4-x^2}$$

A) 2
B) 0
C) 4
D) The limit does not exist; the function is not defined for $x<2$.
Ans: B Difficulty: Moderate Section: 1.3

35. Find the limit or explain why it does not exist.

$$\lim_{x \to -6^+} \sqrt{x^2 + 7x + 6}$$

A) -6
B) 0
C) 6
D) The limit does not exist; the function is not defined for $x < -6$.
Ans: B Difficulty: Moderate Section: 1.3

36. Given that

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

find the limit or explain why it does not exist.

$$\lim_{x \to 0} \frac{2 - 2\cos^2 x}{12x^2}$$

A) 2
B) 1
C) $\frac{1}{6}$
D) The limit does not exist; the function is not defined at $x = 0$.
Ans: C Difficulty: Moderate Section: 1.3

39. Given

$$\lim_{x \to a} f(x) = 3 \text{ and } \lim_{x \to a} g(x) = -2,$$

find

$$\lim_{x \to a} \left[3f(x) - 2g(x)\right]$$

A) 5 B) 11 C) 1 D) 13
Ans: D Difficulty: Moderate Section: 1.3

40. Given

$$\lim_{x \to a} f(x) = 4 \text{ and } \lim_{x \to a} g(x) = -2,$$

find

$$\lim_{x \to a} \left[4f(x) \cdot 3g(x)\right]$$

A) -8 B) -96 C) 12 D) The limit does not exist.
Ans: B Difficulty: Moderate Section: 1.3

41. Given

$$\lim_{x \to a} f(x) = 2, \lim_{x \to a} g(x) = -5 \text{ and } \lim_{x \to a} h(x) = 0,$$

find

$$\lim_{x \to a} \frac{\left[5f(x) + 6g(x)\right]}{h(x)}$$

A) -3 B) -20 C) 11 D) The limit does not exist.
Ans: D Difficulty: Moderate Section: 1.3

47. Find all discontinuities of

$$f(x)=\frac{2x-10}{x^2-25}$$

A) discontinuous at $x=0$
B) discontinuous at $x=\pm 5$
C) discontinuous at $x=25$
D) continuous for all x

Ans: B Difficulty: Moderate Section: 1.4

48. Find all discontinuities of

$$f(x)=\frac{2x}{x^2-2x-15}$$

A) discontinuous at $x=-5,3$
B) discontinuous at $x=5$
C) discontinuous at $x=5,-3$
D) continuous for all x

Ans: C Difficulty: Moderate Section: 1.4

49. Find all discontinuities of

$$f(x)=\frac{6x}{x^2+36}$$

A) discontinuous at $x=36$
B) discontinuous at $x=-6$
C) discontinuous at $x=-6,6$
D) continuous for all x

Ans: D Difficulty: Moderate Section: 1.4

50. Find all discontinuities of

$$f(x)=\begin{cases}5x & \text{if } x<1\\ 7x^2 & \text{if } x\geq 1\end{cases}$$

A) discontinuous at $x=1$
B) discontinuous at $x=-1,1$
C) discontinuous at $x=-5,7$
D) continuous for all x

Ans: A Difficulty: Moderate Section: 1.4

51. Find all discontinuities of

$$f(x)=\frac{2x-6}{x^2-9}$$

and for each discontinuity that is removable, define a new function that removes the discontinuity.

Ans: discontinuous at $x=\pm 3$

The discontinuity at $x=3$ is removable:

$$f(x)=\frac{2}{(x+3)}$$

Difficulty: Moderate Section: 1.4

52. Determine the intervals on which
$$f(x) = \sqrt{3x+9}$$
is continuous.
A) $(-3,\infty)$ B) $[-3,\infty)$ C) $[-3,\infty]$ D) $[3,\infty]$
Ans: B Difficulty: Moderate Section: 1.4

53. Determine the intervals on which
$$f(x) = (x-3)^{3/2}$$
is continuous.
A) $(3,\infty)$ B) $[-3,\infty)$ C) $[3,\infty)$ D) $[-3,\infty]$
Ans: C Difficulty: Moderate Section: 1.4

54. Determine the intervals on which
$$f(x) = \sin(2x+8)$$
is continuous.
A) $(-\infty,\infty)$ B) $(2,8\pi]$ C) $[-2,8\pi]$ D) $[-\infty,\infty]$
Ans: A Difficulty: Moderate Section: 1.4

59. Determine if
$$f(x) = \begin{cases} 3x^2 & \text{if } x < 8 \\ 3x-24 & \text{if } x \geq 8 \end{cases}$$
is continuous at $x = 8$ from the right.
A) $\lim\limits_{x\to 8} f(x) \neq f(8)$, but $f(x)$ is continuous from the right
B) $\lim\limits_{x\to 8} f(x) = f(8)$, so $f(x)$ is continuous from the right
C) $\lim\limits_{x\to 8} f(x) \neq f(8)$, so $f(x)$ is not continuous from the right
D) $\lim\limits_{x\to 8} f(x) = f(8)$, but $f(x)$ is not continuous from the right
Ans: B Difficulty: Moderate Section: 1.4

60. Determine if
$$f(x) = \begin{cases} 4x^2 & \text{if } x \leq 1 \\ 5x-5 & \text{if } x > 1 \end{cases}$$
is continuous at $x = 1$ from the right.
A) $\lim\limits_{x\to 1} f(x) \neq f(d)$ but $f(x)$ is continuous from the right
B) $\lim\limits_{x\to 1} f(x) = f(d)$ so $f(x)$ is continuous from the right
C) $\lim\limits_{x\to 1} f(x) \neq f(d)$ so $f(x)$ is not continuous from the right
D) $\lim\limits_{x\to 1} f(x) = f(d)$ but $f(x)$ is not continuous from the right
Ans: C Difficulty: Moderate Section: 1.4

61. Determine the limit:

$$\lim_{x\to 6^+} \frac{1-2x}{x^2-36}$$

Answer with a number, ∞, $-\infty$ or that the limit does not exist.
A) ∞ B) $-\infty$ C) 0 D) 36 E) The limit does not exist.
Ans: B Difficulty: Moderate Section: 1.5

62. Determine the limit:

$$\lim_{x\to -3} \frac{1-3x}{x^2-9}$$

Answer with a number, ∞, $-\infty$ or that the limit does not exist.
A) ∞ B) $-\infty$ C) 9 D) The limit does not exist.
Ans: D Difficulty: Moderate Section: 1.5

63. Determine the limit:

$$\lim_{x\to -5} \frac{x-9}{x^2-10x+25}$$

A) $-\infty$ B) 0 C) $-\frac{7}{50}$ D) ∞ E) The limit does not exist.
Ans: C Difficulty: Moderate Section: 1.5

65. Determine the limit:

$$\lim_{x\to -3^-} \frac{1-x}{x+3}$$

A) 0 B) $-\frac{1}{9}$ C) ∞ D) $-\infty$ E) The limit does not exist.
Ans: D Difficulty: Moderate Section: 1.5

66. Determine the limit:

$$\lim_{x\to \infty} \frac{4x^2+9x+7}{6x^2+2x+8}$$

A) 1 B) $\frac{2}{3}$ C) ∞ D) does not exist E) $-\infty$
Ans: B Difficulty: Moderate Section: 1.5

67. Find all horizontal and vertical asymptotes of *f*(*x*).

$$f(x) = \frac{4x}{\sqrt{2+x^2}}$$

For each vertical asymptote, determine whether $f(x) \to \infty$ or $f(x) \to -\infty$ on either side of the vertical asymptote.

A) horizontal asymptotes at $f(x) = \pm 4$; there are no vertical asymptotes.

B) horizontal asymptote at $f(x) = 4$, vertical asymptote at $x = -4$; $f(x) \to \infty$ on both sides of $x = -4$

C) horizontal asymptote at $f(x) = -4$, vertical asymptote at $x = 4$; $f(x) \to -\infty$ on both sides of $x = 4$

D) horizontal asymptotes at $f(x) = \pm 4$, vertical asymptote at $x = 0$; $\lim_{x \to 0^-} f(x) = \infty$ and $\lim_{x \to 0^+} f(x) = -\infty$

Ans: A Difficulty: Moderate Section: 1.5

68. Find all horizontal and vertical asymptotes of *f*(*x*).

$$f(x) = \frac{5x}{36 - x^2}$$

For each vertical asymptote, determine whether $f(x) \to \infty$ or $f(x) \to -\infty$ on either side of the vertical asymptote.

A) horizontal asymptote at $f(x) = 0$; there are no vertical asymptotes.

B) horizontal asymptote at $f(x) = 0$, vertical asymptotes at $x = \pm 6$;
$\lim_{x \to -6^-} f(x) = \infty$ $\lim_{x \to -6^+} f(x) = \infty$
$\lim_{x \to 6^-} f(x) = -\infty$ $\lim_{x \to 6^+} f(x) = -\infty$

C) horizontal asymptote at $f(x) = 0$, vertical asymptotes at $x = \pm 6$;
$\lim_{x \to -6^-} f(x) = \infty$ $\lim_{x \to -6^+} f(x) = -\infty$
$\lim_{x \to 6^-} f(x) = \infty$ $\lim_{x \to 6^+} f(x) = -\infty$

D) horizontal asymptote at $f(x) = 0$, vertical asymptotes at $x = \pm 6$;
$\lim_{x \to -6^-} f(x) = -\infty$ $\lim_{x \to -6^+} f(x) = -\infty$ $\lim_{x \to 6^-} f(x) = \infty$ $\lim_{x \to 6^+} f(x) = \infty$

Ans: C Difficulty: Moderate Section: 1.5

69. Find the limit exactly (Hint: multiply and divide by the conjugate expression and simplify). $\lim_{x \to \infty} \left(\sqrt{x^2 + 2} - x \right)$

A) 2 B) –2 C) 0 D) the limit does not exist

Ans: C Difficulty: Moderate Section: 1.5

70. Find the limit exactly (Hint: multiply and divide by the conjugate expression and simplify). $\lim_{x \to \infty} \left(\sqrt{16x^2 - 2x + 3} - 4x \right)$

A) –4 B) 0 C) 6 D) $-\frac{1}{4}$

Ans: D Difficulty: Moderate Section: 1.5

71. Find the limit exactly (Hint: multiply and divide by the conjugate expression and simplify). $\lim_{x\to\infty}\left(\sqrt{8x^2+3x+1}-\sqrt{8x^2+2x+3}\right)$

A) $\sqrt{8}$ B) $\frac{\sqrt{8}}{16}$ C) 8 D) The limit does not exist.

Ans: B Difficulty: Moderate Section: 1.5

CHAPTER3

1. Find an equation of the tangent line to $y = f(x)$ at $x = -3$.
$f(x) = x^3 + x^2 + x$

A) $y = -6x + 18$ B) $y = 22x - 45$ C) $y = 6x + 18$ D) $y = 22x + 45$

Ans: D Difficulty: Moderate Section: 2.1

2. Find an equation of the tangent line to $y = f(x)$ at $x = -2$.
$f(x) = 2x^3 + 5$

A) $y = 9x - 16$ B) $y = -24x + 37$ C) $y = 24x + 37$ D) $y = 24x - 37$

Ans: C Difficulty: Moderate Section: 2.1

3. Compute $f'(2)$ for the function $f(x) = \frac{3}{x^2+5}$.

A) $\frac{3}{4}$ B) $\frac{4}{27}$ C) $-\frac{20}{81}$ D) $-\frac{4}{27}$

Ans: D Difficulty: Moderate Section: 2.2

4. Compute $f'(2)$ for the function $f(x) = 3x^3 - 6x$.

A) 48 B) 30 C) 24 D) –30

Ans: B Difficulty: Moderate Section: 2.2

5. Compute the derivative $f'(x)$ of $f(x) = \sqrt{6x^2+3}$.

A) $f'(x) = \frac{-12x}{\sqrt{6x^2+3}}$

B) $f'(x) = \frac{6x}{\sqrt{6x^2+3}}$

C) $f'(x) = \frac{-6x}{\sqrt{6x^2+3}}$

D) $f'(x) = \frac{-6x}{\sqrt{12x+3}}$

Ans: B Difficulty: Moderate Section: 2.2

6. Compute the derivative $f'(x)$ of $f(x) = \dfrac{7}{2x-5}$.

A) $f'(x) = \dfrac{-14}{(2x-5)^2}$

B) $f'(x) = \dfrac{-2}{(2x-5)^2}$

C) $f'(x) = \dfrac{-7}{(2x-5)^2}$

D) $f'(x) = \dfrac{14}{(2x-5)^2}$

Ans: A Difficulty: Moderate Section: 2.2

7. $\lim\limits_{h\to 0}\dfrac{(1+h)^3+(1+h)-2}{h}$ equals $f'(a)$ for some function $f(x)$ and some constant *a*. Determine which of the following could be the function $f(x)$ and the constant *a*.

A) $f(x) = x^3 - x$ and $a = -1$

B) $f(x) = x^3 + x^2$ and $a = 0$

C) $f(x) = x^3 + x - 20$ and $a = 0$

D) $f(x) = x^3 + x$ and $a = 1$

Ans: D Difficulty: Moderate Section: 2.2

8. $\lim\limits_{h\to 0}\dfrac{\dfrac{1}{(h+3)^2}-\dfrac{1}{9}}{h}$ equals $f'(a)$ for some function $f(x)$ and some constant *a*. Determine which of the following could be the function $f(x)$ and the constant *a*.

A) $f(x) = \dfrac{1}{x^2}$ and $a = 3$

B) $f(x) = \dfrac{3}{x^2}$ and $a = 3$

C) $f(x) = -\dfrac{1}{x^2}$ and $a = 4$

D) $f(x) = -\dfrac{1}{x^2}$ and $a = -3$

Ans: A Difficulty: Moderate Section: 2.2

9. Find the derivative of $f(x) = x^2 + 3x + 2$.

A) $x + 3$ B) $2x^2 + 2$ C) $2x + 3$ D) $-2x - 3$

Ans: C Difficulty: Easy Section: 2.3

10. Find the derivative of $f(x) = \dfrac{2}{x} - 3x + 2$.

A) $f'(x) = \dfrac{2}{x^2} - 3$

B) $f'(x) = -\dfrac{2}{x^2} - 3$

C) $f'(x) = -\dfrac{2}{x} - 3$

D) $f'(x) = -\dfrac{2}{x^2} - 6x^2$

Ans: B Difficulty: Easy Section: 2.3

11. Find the derivative of $f(x)=\dfrac{x^2-5x+4}{7x}$.

A) $f'(x)=\dfrac{2x-5}{7}$

B) $f'(x)=-\dfrac{2x}{7}+\dfrac{5}{7}$

C) $f'(x)=\dfrac{1}{7}-\dfrac{4}{7x^2}$

D) $f'(x)=\dfrac{x^2}{7}-\dfrac{5x}{7}+\dfrac{4}{7x}$

Ans: C Difficulty: Moderate Section: 2.3

12. Find the derivative of $f(x)=\dfrac{-5x^2-7x+7}{\sqrt{x}}$.

A) $f'(x)=-\dfrac{15\sqrt{x}}{2}-\dfrac{7}{2\sqrt{x}}-\dfrac{7}{2\sqrt{x^3}}$

B) $f'(x)=-\dfrac{20x+14}{x}$

C) $f'(x)=-\dfrac{15\sqrt{x}}{2}+\dfrac{7}{2\sqrt{x}}+\dfrac{7}{2\sqrt{x^3}}$

D) $f'(x)=-15\sqrt{x}-\dfrac{7}{\sqrt{x}}+\dfrac{7}{\sqrt{x^3}}$

Ans: A Difficulty: Moderate Section: 2.3

12. Find the third derivative of $f(x)=-2x^5-9x-\dfrac{1}{x}$.

A) $f'''(x)=-120x^2-\dfrac{6}{x^4}$

B) $f'''(x)=-120x^2-9+\dfrac{6}{x^4}$

C) $f'''(x)=-40x^3-\dfrac{2}{x^3}$

D) $f'''(x)=-120x^2+\dfrac{6}{x^4}$

Ans: D Difficulty: Moderate Section: 2.3

13. Find the second derivative of $y=2x+\dfrac{2}{\sqrt{x}}$.

A) $\dfrac{d^2y}{dx^2}=2+\dfrac{3}{2\sqrt{x^5}}$ B) $\dfrac{d^2y}{dx^2}=\dfrac{3}{2\sqrt{x^5}}$ C) $\dfrac{d^2y}{dx^2}=-\dfrac{3}{2\sqrt{x^5}}$ D) $\dfrac{d^2y}{dx^2}=\dfrac{3}{2\sqrt{x^3}}$

Ans: B Difficulty: Moderate Section: 2.3

14. Find the derivative of $\left(-9\sqrt{x}+6x\right)\left(9x^2-\frac{1}{x}\right)$.

A) $f'(x)=162x^2+\frac{405}{2}x^{3/2}-\frac{9}{2x^{3/2}}$

B) $f'(x)=162x^2-\frac{405}{2}x^{3/2}-\frac{9}{2x^{3/2}}$

C) $f'(x)=-162x^2-\frac{405}{2}x^{3/2}+\frac{9}{2x^{3/2}}$

D) $f'(x)=162x^2-\frac{405}{2}x^{3/2}-\frac{12}{x}-\frac{9}{2x^{3/2}}$

Ans: B Difficulty: Moderate Section: 2.4

15. Find the derivative of $f(x)=\left(4\sqrt[3]{x}-8\right)x$.

A) $f'(x)=-\frac{16}{3}\sqrt[3]{x}-8$

B) $f'(x)=\frac{4}{3}\sqrt[3]{x}+8$

C) $f'(x)=\frac{16}{3}\sqrt[3]{x}-8$

D) $f'(x)=\frac{8}{3}\sqrt[3]{x}-16$

Ans: C Difficulty: Moderate Section: 2.4

16. Find the derivative of $f(x)=\frac{-2x+9}{-6x-4}$.

A) $\frac{-62}{(-6x-4)^2}$ B) $\frac{1}{3}$ C) $-\frac{1}{3}$ D) $\frac{62}{(-6x-4)^2}$

Ans: D Difficulty: Moderate Section: 2.4

17. Find the derivative of $f(x)=\frac{-7x}{-3x^2-2}$.

A) $\frac{-21x^2+14}{(-3x^2-2)^2}$ B) $-\frac{7}{3x^2}$ C) $\frac{21x^2-14}{(-3x^2-2)^2}$ D) $\frac{7}{3x^2}$

Ans: A Difficulty: Moderate Section: 2.4

18. Find an equation of the line tangent to $h(x)=f(x)g(x)$ at $x=-2$ if $f(-2)=-2$, $f'(-2)=-3$, $g(-2)=3$, and $g'(-2)=2$.

A) $y=5x-16$ B) $y=5x-32$ C) $y=-13x-32$ D) $y=-13x+20$

Ans: C Difficulty: Moderate Section: 2.4

19. Find an equation of the line tangent to $h(x)=\dfrac{f(x)}{g(x)}$ at $x=-1$ if $f(-1)=2$, $f'(-1)=3$, $g(-1)=1$, and $g'(-1)=1$.

A) $y=5x+3$ B) $y=x+3$ C) $y=5x+7$ D) $y=x+1$

Ans: B Difficulty: Moderate Section: 2.4

20. Find the derivative of $f(x)=\sqrt{7x^2-1}$.

A) $f'(x)=\dfrac{14x}{\sqrt{7x^2-1}}$

B) $f'(x)=\dfrac{28x}{\sqrt{7x^2-1}}$

C) $f'(x)=\dfrac{-7x}{\sqrt{7x^2-1}}$

D) $f'(x)=\dfrac{7x}{\sqrt{7x^2-1}}$

Ans: D Difficulty: Moderate Section: 2.5

21. Find the derivative of $f(x)=\dfrac{-8}{\sqrt{7x^2+7}}$.

A) $f'(x)=\dfrac{56x}{\sqrt{(7x^2+7)^3}}$

B) $f'(x)=\dfrac{-112x}{\sqrt{(7x^2+7)^3}}$

C) $f'(x)=\dfrac{-56x}{\sqrt{(7x^2+7)^3}}$

D) $f'(x)=\dfrac{-16x}{\sqrt{(7x^2+7)^3}}$

Ans: A Difficulty: Moderate Section: 2.5

22. Find the derivative of $f(x)=\sqrt{\dfrac{x}{x^2+4}}$.

A) $\dfrac{1}{2}\left[\dfrac{1}{\sqrt{x\left(x^2+4\right)}}-\sqrt{\dfrac{x}{\left(x^2+4\right)^3}}\right]$

B) $\dfrac{1}{2\sqrt{x\left(x^2+4\right)}}-\sqrt{\left(\dfrac{x}{x^2+4}\right)^3}$

C) $\dfrac{1}{2}\left[\dfrac{1}{\sqrt{x\left(x^2+4\right)}}-\sqrt{x\left(x^2+4\right)}\right]$

D) $\sqrt{\dfrac{1}{x^2+4}-\dfrac{2x^2}{\left(x^2+4\right)^2}}$

Ans: B Difficulty: Moderate Section: 2.5

23. Find the derivative of $f(x) = \dfrac{(x^2+2)^4}{9}$.

A) $f'(x) = \dfrac{4}{9}x(x^2+2)^3$

B) $f'(x) = \dfrac{2}{9}x(x^2+2)^3$

C) $f'(x) = \dfrac{8}{9}x(x^2+2)^3$

D) $f'(x) = \dfrac{1}{9}x(x^2+2)^3$

Ans: C Difficulty: Moderate Section: 2.5

24. Find an equation of the line tangent to $f(x) = \dfrac{1}{\sqrt{x^2-35}}$ at $x = 6$.

A) $y = -6x + 35$ B) $y = -6x$ C) $y = 6x + 7$ D) $y = -6x + 37$

Ans: D Difficulty: Moderate Section: 2.5

25. Compute the derivative of $h(x) = f\left(g(x)\right)$ at $x = 5$ where $f(5) = -6$, $g(5) = -1$, $f'(5) = 9$, $f'(-1) = 4$, $g'(5) = 8$, and $g'(-1) = -2$.

A) $h'(5) = 72$ B) $h'(5) = -48$ C) $h'(5) = 32$ D) $h'(5) = 6$

Ans: C Difficulty: Moderate Section: 2.5

26. Find the derivative of $f(x) = 8\sin(3x) + 6\cos(2x) - x$.

A) $f'(x) = 24\cos 3x - 12\sin 2x - 1$

B) $f'(x) = 8\cos 3x - 6\sin 2x - 1$

C) $f'(x) = -24\cos 3x + 12\sin 2x - 1$

D) $f'(x) = 3\cos 3x - 2\sin 2x - 1$

Ans: A Difficulty: Easy Section: 2.6

27. Find the derivative of $f(x) = 3\sin^2 x + 7x^2$.

A) $f'(x) = -6\sin x\cos x + 14x$

B) $f'(x) = 6\sin x\cos x + 7x$

C) $f'(x) = 6\sin x + 14x$

D) $f'(x) = 6\sin x\cos x + 14x$

Ans: D Difficulty: Easy Section: 2.6

28. Find the derivative of $f(x) = \sqrt{\sin x \sec x}$.

A) $f'(x) = \dfrac{\sec x}{2\sqrt{\tan x}}$

B) $f'(x) = \dfrac{\sec^2 x}{2\sqrt{\tan x}}$

C) $f'(x) = \dfrac{\sec^2 x}{\sqrt{\tan x}}$

D) $f'(x) = \dfrac{\sec x \tan x}{2\sqrt{\tan x}}$

Ans: B Difficulty: Moderate Section: 2.6

29. Find the derivative of $f(x) = \dfrac{-6\cos x^2}{x^2}$.

A) $f'(x) = \dfrac{-12(x^2 \sin x^2 + \cos x^2)}{x^3}$

B) $f'(x) = \dfrac{12(x \sin x^2 + \cos x^2)}{x^3}$

C) $f'(x) = \dfrac{12(x^2 \sin x^2 + \cos x^2)}{x^3}$

D) $f'(x) = \dfrac{12(x^2 \sin x^2 + \cos x^2)}{x^4}$

Ans: C Difficulty: Moderate Section: 2.6

30. For $f(x) = \sin x$, find $f^{(102)}(x)$.

A) $\cos x$ B) $-\cos x$ C) $\sin x$ D) $-\sin x$

Ans: D Difficulty: Easy Section: 2.6

31. Given that $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$, find $\lim\limits_{t \to 0} \dfrac{\sin(7t)}{9t}$.

A) $\dfrac{1}{9}$ B) 63 C) $\dfrac{7}{9}$ D) $\dfrac{1}{7}$

Ans: C Difficulty: Easy Section: 2.6

32. Given that $\lim\limits_{x \to 0} \dfrac{\cos x - 1}{x} = 0$, find $\lim\limits_{t \to 0} \dfrac{-7\cos t - 1}{5t}$.

A) 0 B) $-\dfrac{7}{5}$ C) -35 D) $-\dfrac{5}{7}$

Ans: A Difficulty: Easy Section: 2.6

33. Given that $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$, find $\lim\limits_{t \to 0} \dfrac{8t}{\sin(7t)}$.

A) 56 B) $\dfrac{1}{8}$ C) $\dfrac{7}{8}$ D) $\dfrac{8}{7}$

Ans: D Difficulty: Easy Section: 2.6

34. Given that $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$, find $\lim\limits_{t \to 0} \dfrac{\tan(-7t)}{-3t}$.

A) $-\dfrac{1}{7}$ B) $\dfrac{7}{3}$ C) $\dfrac{3}{7}$ D) $-\dfrac{1}{3}$

Ans: B Difficulty: Moderate Section: 2.6

35. Compute the slope of the line tangent to $6x^2 + 2xy + 5y^2 = 8$ at $(4,\ 4)$.

A) slope $= -\frac{5}{6}$ B) slope $= -\frac{7}{6}$ C) slope $= -\frac{6}{7}$ D) slope $= -\frac{8}{5}$

Ans: B Difficulty: Moderate Section: 2.7

36. Find the derivative $y'(x)$ implicitly if $-y^2 - \sqrt{xy} = -6$.

A) $y'(x) = \frac{y}{2y\sqrt{xy} + x}$

B) $y'(x) = -\frac{y\sqrt{xy}}{4y - x}$

C) $y'(x) = -\frac{y}{4y\sqrt{xy} - x}$

D) $y'(x) = -\frac{y}{4y - x\sqrt{xy}}$

Ans: C Difficulty: Moderate Section: 2.7

37. Find the derivative $y'(x)$ implicitly if $-8\sin xy - 5x = -5$.

A) $y'(x) = \frac{5}{8x\cos xy} + \frac{y}{x}$

B) $y'(x) = -\frac{5}{8x} - \frac{y}{x\cos xy}$

C) $y'(x) = -\frac{5\cos xy}{8x} - \frac{y}{x}$

D) $y'(x) = -\frac{5}{8x\cos xy} - \frac{y}{x}$

Ans: D Difficulty: Moderate Section: 2.7

38. Find the second derivative, $y''(x)$, of $5\sqrt{x^3} - 2\sqrt{y^3} = -5$.

A) $y''(x) = \frac{5}{4\sqrt{xy}} - \frac{y'}{2y}$

B) $y''(x) = \frac{5}{4\sqrt{xy}} - \frac{(y')^2}{2y}$

C) $y''(x) = -\frac{5}{2\sqrt{xy}} - \frac{(y')^2}{2y}$

D) $y''(x) = -\frac{5}{4\sqrt{xy}} + \frac{(y')^2}{2y}$

Ans: B Difficulty: Moderate Section: 2.7

39. Find the second derivative, $y''(x)$, of $-3y^2 = -2x^3 + x - \cos y$.

A) $y''(x) = \frac{-4x + (-\cos y - 3)(y')^2}{-3y + \sin y}$

B) $y''(x) = \frac{-2x + (\cos y - 6)y'}{-6y - \cos y}$

C) $y''(x) = \frac{-12x + (\cos y - 3)y^2}{-6y^2 - \sin y}$

D) $y''(x) = \frac{-12x + (\cos y + 6)(y')^2}{-6y - \sin y}$

Ans: D Difficulty: Moderate Section: 2.7