Kingdom of Saudi Arabia
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Faculty of Science
Dept. of Mathematics

Instructions: **(30 points) Solve each of the following problems and choose the correct answer :**

1. **The function** $f(x) = 3^{-x}$ **is**
   - **(a) Decreasing on** $\mathbb{R}$ ★
   - **(b) Increasing on** $(-\infty, 0)$
   - **(c) Increasing on** $\mathbb{R}$
   - **(d) Increasing on** $(0, \infty)$

2. **The domain of the function** $f(x) = \sqrt{e^x}$ **is**
   - **(a)** $[0, \infty)$
   - **(b)** $(-\infty, \infty)$ ★
   - **(c)** $(-\infty, 0)$
   - **(d)** $(0, \infty)$

3. **Simplifying the expression** $\dfrac{(2^3)^{5x} \times 4}{8}$ **gives**
   - **(a)** 2^{15x-1} ★
   - **(b)** 2^{8x-1}
   - **(c)** 2^{15x}
   - **(d)** 2^{15x+1}

4. **The form of the exponential function** $f(x) = Ca^x$, **whose curve is passing through the points** $(1, 6), (3, 24)$, **is**
   - **(a)** $3.(-2)^x$
   - **(b)** -2.3^x
   - **(c)** 3.2^x ★
   - **(d)** $2.(-3)^x$

5. $\tan(\sin^{-1} x) =$
   - **(a)** $\dfrac{x}{\sqrt{1+x^2}}$
   - **(b)** $\dfrac{x}{\sqrt{1-x^2}}$ ★
   - **(c)** $\dfrac{-x}{\sqrt{1+x^2}}$
   - **(d)** $\dfrac{-x}{\sqrt{1-x^2}}$

6. **If the function** $f(x) = \dfrac{1-e^x}{1+e^x}$, **then** $f^{-1}(x) =$
   - **(a)** $\ln\left(\dfrac{1+y}{1-y}\right)$
   - **(b)** $\ln\left(\dfrac{1}{1+x}\right)$
   - **(c)** $\ln\left(\dfrac{1-y}{1+y}\right)$
   - **(d)** $\ln\left(\dfrac{1-x}{1+x}\right)$ ★

7. **If the function** $f(x) = \dfrac{x-1}{3x+1}$ **, then the range of** $f^{-1}(x)$ **is**

(a) $\left(-\infty, \frac{1}{3}\right) \cup \left(\frac{1}{3}, \infty\right)$ **(b)** $\left(-\infty, -\frac{1}{3}\right) \cup \left(-\frac{1}{3}, 1\right) \cup (1, \infty)$

(c) $\left(-\infty, -\frac{1}{3}\right) \cup \left(-\frac{1}{3}, \infty\right)$ ★ **(d)** $(-\infty, 1) \cup (1, \infty)$

8. **The function** $f(x) = \sin x$ **has an inverse function on the interval** $[0, \pi]$

(a) True **(b) False** ★

9. $\log_3 \sqrt{3} - e^{-2\ln 2} + \log_3 18 - \log_3 2 =$

(a) $\sqrt{3} + 6$ **(b)** $\frac{9}{2}$

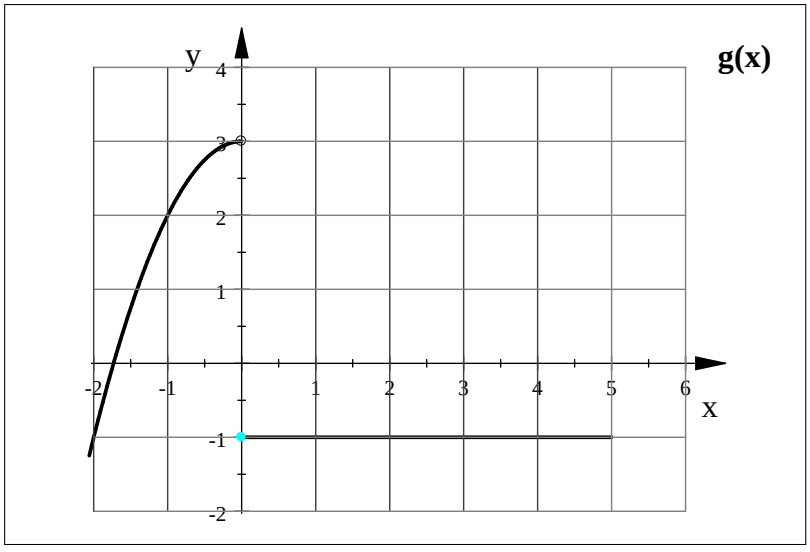
(c) $\frac{9}{4}$ ★ **(d)** $\frac{1}{2}$

10. **If** $\ln(2 + 3x) > 0$**,then** $x \in$

(a) $\left(\frac{2}{3}, \infty\right)$ **(b)** $\left(\frac{1}{3}, \infty\right)$

(c) $\left(-\frac{2}{3}, \infty\right)$ **(d)** $\left(-\frac{1}{3}, \infty\right)$ ★

11. **If** $g(x)$ **is the function whose graph is shown, then** $\lim_{x \to 0^-} g(x) =$



(a) 3 ★ **(b)** 0
(c) -1 **(d)** **Does not exist**

12. **If** $\lim_{x\to a^-} f(x) = \infty$ **and** $\lim_{x\to a^+} f(x) = -\infty$, **then** $\lim_{x\to a} f(x) =$

(a) 0 **(b)** $-\infty$
(c) ∞ **(d)** **Does not exist** ★

13. $\lim_{x\to 3^-} \dfrac{x^2+1}{x-3} =$

(a) ∞ **(b)** $-\infty$ ★
(c) 0 **(d)** **10**

14. **The curve of the function** $f(x) = \ln(x-2)$ **has a vertical asymptote at**

(a) $x = -2$ **(b)** $x = 0$
(c) $x = 1$ **(d)** $x = 2$ ★

15. $\lim_{x\to -1^-} [[x]] + 1 =$

(a) 0 **(b)** 1
(c) -1 ★ **(d)** **Does not exist**

16. $\lim_{x\to 3} \dfrac{x^2-3x-1}{|x-4|} =$

(a) 1 **(b)** 0
(c) -1★ **(d)** **Does not exist**

17. **If** $4x - 9 \le f(x) \le x^2 - 4x + 7$, **for** $x \ge 0$, **then** $\lim_{x\to 4} f(x) =$

(a) 4 **(b)** 7 ★
(c) -7 **(d)** **Does not exist**

18. $\lim_{x\to 0^+} x^2 e^{\sin(\pi/x)} =$

(a) 0 ★ **(b)** ∞
(c) $-\infty$ **(d)** **Does not exist**

19. $\lim_{t\to 9} \dfrac{9-t}{3-\sqrt{t}} =$

(a) -6 **(b)** 0
(c) 6 ★ **(d)** **Does not exist**

20. **If** $h(x) \le g(x)$ **when** x **is near** a **(except possibly at** a**) and** $\lim_{x\to a} h(x), \lim_{x\to a} g(x)$ **are both exist, then** $\lim_{x\to a} h(x) \le \lim_{x\to a^-} g(x)$

(a) True ★ **(b) False**

21. $\lim_{x\to 0} \sqrt[4]{x} =$

(a) $-\infty$ **(b)** 0
(c) ∞ **(d) Does not exist** ★

22. $\lim_{x\to 1} \sin^{-1}\left(\dfrac{x-1}{x^2-1}\right) =$

(a) $\dfrac{\pi}{2}$ **(b)** $\dfrac{\pi}{3}$
(c) $\dfrac{\pi}{6}$ ★ **(d) Does not exist**

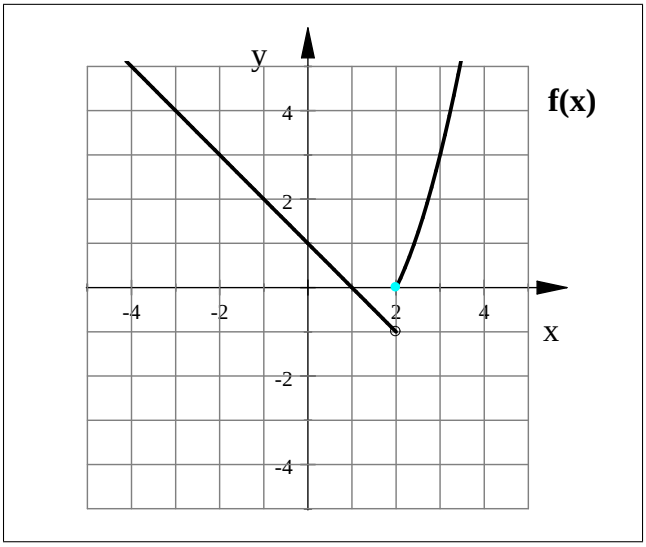
23. **If the function** $f(t) = \begin{cases} \dfrac{1}{t} - \dfrac{1}{t^2+t} & \textbf{if} \quad t \neq -1 \\ 2 & \textbf{if} \quad t = -1 \end{cases}$ **, then** $f(t)$ **is**

(a) Continuous at $t = -1$ **(b) Continuous form the right at** $t = -1$
(c) Discontinuous at $t = -1$ ★ **(d) Continuous form the left at** $t = -1$

24. **The function** $f(x) = \ln(x^2 - 4)$ **is continuous on**

(a) $(0, \infty)$ **(b)** $(-\infty, -2) \cup (2, \infty)$ ★
(c) $(-\infty, -2] \cup [2, \infty)$ **(d)** $[0, \infty)$

25. **The accompanying figure shows a graph of a function** $f(x)$ **that is**



(a) Discontinuous from the right at $x = 2$ **(b) Continuous from the left at $x = 2$**
(c) Continuous at $x = 2$ **(d) Continuous from the right at $x = 2$★**

26. $\lim_{x \to -\infty} \dfrac{7x^3 - 5x^2 - 3}{8x^3 + x} =$

(a) $-\dfrac{7}{8}$ **(b)** ∞

(c) $\dfrac{7}{8}$ ★ **(d) Does not exist**

27. $\lim_{x \to \infty} \dfrac{5}{\cos^{-1}\left(\sqrt{\dfrac{x^3}{x^3+1}}\right)} =$

(a) ∞ ★ **(b)** $-\infty$

(c) 5 **(d) 0**

28. $\lim_{x \to -\infty} \cos x^3 =$

(a) ∞ **(b)** $-\infty$

(c) -1 **(d) Does not exist** ★

29 $\lim_{x \to \infty} e^{x - x^3} =$

(a) ∞ **(b)** 0 ★

(c) $-\infty$ **(d) Does not exist**

30 **The horizontal asymptote of the function** $f(x) = \dfrac{\tan^{-1} x}{x^5 - 1}$ **is the line**

(a) $y = 0$ ★ **(b)** $y = -\dfrac{\pi}{2}$

(c) $y = \dfrac{\pi}{2}$ **(d)** $y = 1$