



## Math 110 "Students Syllabus" / Term(1)

Book: Calculus Metric Version Early Transcendentals by James Stewart 8th edition **(No Calculator)**



		Lectures			
Chapter Title	Section	Theoretical (Definitions & Theorem)	Examples	Exercises	HW
<b>Appendixes</b>	Appendix A Numbers, Inequalities and Absolute Values	<ul style="list-style-type: none"> <li>• Intervals (Table).</li> <li>• Inequalities</li> <li>• Absolute value.</li> <li>• Properties (1-6).</li> </ul>	4,7 <b>Read</b> 1,2,3,6,8		
	Appendix B Coordinate Geometry and lines	<ul style="list-style-type: none"> <li>• Slope of line.</li> <li>• Point-slope form of the equation of a line.</li> <li>• Slope-Intercept form of the equation of a line.</li> <li>• Parallel and perpendicular lines.</li> </ul>	4 Read 7,8		
	Appendix D Trigonometry	<ul style="list-style-type: none"> <li>• Angles (convert formula).</li> <li>• The Trigonometric functions.</li> <li>• Trigonometric identities, 6-11, 15.</li> <li>• <b>Graphs</b> of the trigonometric functions (<b>sin, cos, tan only</b>) (domain, period of all) (<b>range of sin, cos, tan only</b>).</li> </ul>	1,4	4,33	1-12(odd) 29-34(odd)

# Ch1: Functions and Models

<p><b>1.1 Four ways to represent a function</b></p>	<ul style="list-style-type: none"> <li>• <b>Definitions: Function, Domain and Range.</b></li> <li>• <b>Vertical line test.</b></li> <li>• <b>Piecewise defined functions.</b></li> <li>• <b>Symmetry (odd &amp; even) functions. **</b></li> <li>• <b>Increasing and Decreasing Functions. (<u>open or closed intervals are correct</u>)</b></li> </ul>	<p>2,6,7,8,11 Read 1</p>	<p>9, 31, 33, 34, 38, 40, 49, 76.</p>	<p>7-10,32- 34,41, 46,73-78</p>
<p><b>1.2 Mathematical Models: A Catalog of essential functions</b></p>	<ul style="list-style-type: none"> <li>• <b>Essential functions: Polynomials, power, rational, algebraic, trigonometric, exponential and logarithmic (<math>\ln x</math>).</b></li> <li>• <b>Graphs of Functions *</b></li> </ul>	<p>5,6</p>	<p>2</p>	<p>1</p>
<p><b>1.3 New functions from old functions</b></p>	<ul style="list-style-type: none"> <li>• <b>Transformation of functions.</b> i) Vertical and horizontal shifts. ii) Vertical and horizontal reflecting.</li> <li>• <b>Combination of functions (<math>f \pm g</math>, <math>f \cdot g</math>, <math>f/g</math>, Composite Functions) and their domain.</b></li> </ul> <p><b>Remark:</b> <b>Don't simplify the function <math>f/g</math> before calculating the domain.</b></p>	<p><b>1 (without <math>y=2\sqrt{x}</math>), 2, 3(b) add to example (3)</b> <b>Sketch the graph of</b> (c) <math>y =  \cos x </math> (d) <math>y =  \cos x  + 3</math> (e) <math>y = \cos(x - \frac{\pi}{2})</math> <b>Then find the domain and range,</b> <b>6-9</b></p>	<p><b>1(a-f)</b> <b>Add to exercise (1) and solve it for <math>y=e^x</math> and <math>y=x^2</math></b> <b>32</b></p>	<p>29-39(odd),41,47 <b>*try to sketch</b> <math>y = \cos x - 3</math> <math>y = 2 + \cos x</math> <math>y =  \sin x </math> <math>y =  \sin x  + 3</math> <b>Then find the domain and range</b></p>
<p><b>1.4 Exponential Functions</b></p>	<ul style="list-style-type: none"> <li>• <b>Laws of Exponents.</b></li> <li>• <b>The Number e.</b></li> </ul>	<p>1</p>	<p>2, 13, 19, 20</p>	<p>1,3,17</p>
<p><b>1.5 Inverse Functions and Logarithms</b></p>	<ul style="list-style-type: none"> <li>• <b>Definition1: (1-1) &amp; horizontal line text.</b></li> <li>• <b>Definition 2: Inverse Functions.</b></li> <li>• <b>How to find the inverse function.</b></li> <li>• <b>Logarithmic functions.</b></li> <li>• <b>Natural logarithm.</b></li> <li>• <b>Graphs and growth of natural logarithm.</b></li> <li>• <b>Inverse of Trigonometric Functions: (<math>\sin^{-1}, \cos^{-1}, \tan^{-1}</math> only).</b></li> <li>• <b>Table 11 (def. only without domain and range).</b></li> </ul>	<p><b>1, 2, Add prove that the function <math>y = \sqrt[3]{\frac{x+2}{2}}</math> is 1-1 "by def."</b> <b>4, Replace <math>f(x)</math> in example(5) by <math>f(x) = \sqrt{x-1}</math></b> <b>7-13</b> <b>Read 3,6</b></p>	<p>22, 23, 37(b), 40, 48(a), 51(a,b), 53(a), 57, 64, 68.</p>	<p>21-26(odd) 35-41(odd) 52</p>

**Ch2: Limits and derivatives**

<p><b>2.2 The Limits of a Functions</b></p>	<ul style="list-style-type: none"> <li>• Definition1-6.</li> <li>• One-sided limits.</li> <li>• Infinite limits: (vertical asymptote).</li> <li>• Figure 17.</li> </ul>	<p>1,7-10</p>	<p>9, <u>12</u>, 39, 44</p>	<p>4,7,8,11</p>
<p><b>2.3 Calculating Limits Using the Limits Laws</b></p>	<ul style="list-style-type: none"> <li>• The Limits Laws 1-11</li> <li>• Theorem1, 2.</li> <li>• The squeezed theorem+ Figure 7.</li> <li>• limit of trigonometric function(by theorem)*<u>P.191 relation 2, P.192 relation 3</u> +relations in 'notes in math110'.</li> </ul>	<p>2(a)-9,11 example (8): Let it (T or F) instead of (Show that)  P. 195: 5,6</p>	<p>15, 23, 24, 29, 57  p.197: 42, 45, 48, 49, 50, 59</p>	<p>12, 19, 20,22,25, 27, 31, 32,35-37,  p. 197: 39</p>
<p><b>2.5 Continuity</b></p>	<ul style="list-style-type: none"> <li>• Definition1: Continuity at A number.</li> <li>• Definition2: Continuity from the right and from the left.</li> <li>• Theorem 4-9.</li> <li>• Theorem 10: The intermediate value theorem.</li> </ul>	<p>2(a-c), 6, 8, 9 Read5, 7 example (10): Let it (T or F) instead of (Show that)</p>	<p>3, 45</p>	<p>17, 20, 21, 25, 38, 43</p>
<p><b>2.6Limits at infinity</b></p>	<ul style="list-style-type: none"> <li>• Definition1-3.</li> <li>• Theorem 4-6.</li> <li>• Infinite limits at infinity.</li> <li>• <math>\lim_{n \rightarrow \infty} ax^n</math> if n odd or even.</li> </ul>	<p>1-11</p>	<p>36, 49</p>	<p>19, 30, 35, 37, 50</p>
<p><b>2.7 Derivatives and rates of change</b></p>	<ul style="list-style-type: none"> <li>• Tangents.</li> <li>• Definition 1, 2.</li> <li>• Derivatives.</li> <li>• Definition 4, 5.</li> </ul>	<p>1,4,5</p>		
<p><b>2.8 The Derivatives as a Function</b></p>	<ul style="list-style-type: none"> <li>• Formulas 1, 2.</li> <li>• Other Notations.</li> <li>• Definition 3, Theorem 4.</li> <li>• Higher Derivatives.</li> </ul>	<p>3, 5, 7</p>		<p>29, 55</p>

<b>Ch3: Differentiation Rules</b>	3.1 The Derivative of polynomials and exponential function	<ul style="list-style-type: none"> <li>• Constant functions.</li> <li>• Power functions.</li> <li>• <u>Definition of normal line P.175.</u></li> <li>• New derivatives from old.</li> <li>• Derivative of the natural exponential function.</li> </ul>	1-6, 8	23	3-31(odd), 37
	3.2 The product and quotient rules	<ul style="list-style-type: none"> <li>• The product rule.</li> <li>• Quotient rule.</li> </ul>	1-5		3-33(odd)
	3.3 Derivatives of Trigonometric Functions	<ul style="list-style-type: none"> <li>• Formulas 4-6.</li> <li>• Derivative of Trigonometric Functions.</li> </ul>	1,2(diff. only), 4-6	21, 42, 45, 48, 49, 50, 59	1-7(odd), 39,51
	3.4 The Chain Rule and Parametric Equations	<ul style="list-style-type: none"> <li>• The Chain Rule.</li> <li>• The power rule combined with the chain rule.</li> <li>• Formula 5.</li> </ul>	1, add to example (2) find $y''$ , 3-9	23, 53	1-15(odd), 44, 47, 48
	3.5 Implicit Differentiation	<ul style="list-style-type: none"> <li>• Derivatives of Inverse Trigonometric Functions.</li> </ul>	1, 2(a,b), 3-5,	12, 25	5-11(odd), 35, 37, 49, 55
	3.6 Derivatives of Logarithmic Functions	<ul style="list-style-type: none"> <li>• Formulas 1-4.</li> <li>• Logarithmic differentiation.</li> </ul>	1-8	19, 52	3-15(odd), 21, 31, 43-47
	<b>Ch4: Applications of Differentiation</b>	4.1 Maximum and Minimum Values	<ul style="list-style-type: none"> <li>• Definition 1, 2</li> <li>• Extreme Value Theorem.</li> <li>• Definition 6 (Critical Number).</li> <li>• Formula 7.</li> <li>• The closed Interval Method.</li> </ul>	4, 7, 8 Read 2, 3	4
4.3 How derivatives affect the shape of a graph		<ul style="list-style-type: none"> <li>• Increasing/decreasing test</li> <li>• The First derivative Test</li> <li>• Definition: (concavity) + Concavity test.</li> <li>• Definition: inflection point</li> <li>• Second derivative test</li> </ul>	1,2,6 Read 7	1, 9 12	9,19

**\* The graphs that students must Know:**

$Y = \sin x, y = \cos x, y = \tan x$

$Y = x, y = |x|, y = \sqrt{x}, \sqrt[3]{x}, \sqrt[4]{x}, \sqrt[5]{x}, \dots$

$Y = x^2$ , (and similarly  $y = x^4, y = x^6, \dots$ etc)

$Y = x^3$ , (and similarly  $y = x^5, y = x^7, \dots$ etc)

$Y = \frac{1}{x}$ , (and similarly  $Y = \frac{1}{x^3}, Y = \frac{1}{x^5} \dots$ etc)

$Y = \frac{1}{x^2}$ , (and similarly  $Y = \frac{1}{x^4}, Y = \frac{1}{x^6} \dots$ etc)

**Exponential function, logarithmic function.**

**\*\* Trigonometric functions (odd & even):**

Even	Odd
$\cos x$	$\sin x$
$\sec x$	$\csc x$
	$\tan x$
	$\cot x$

**Marks distribution:-**

	First Exam	Second Exam	Final Exam	
Time ; marks	120 min; 30 marks	120 min; 30 marks	120 min; 40 marks	Total: 100

**Note**

- ✓ Appendices A&B are not included in the exams.
- ✓ See the **workshop** at [hashoaib.kau.edu.sa](http://hashoaib.kau.edu.sa)