

AP CALCULUS BC

Unit 2 Outline – Differentiation and Fundamental Properties

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/22	AVERAGE RATES OF CHANGE	<p>Ex. 1 On Mars, the equation for free fall at the surface is $s = 1.86t^2$ m with t in seconds. Assume a rock is dropped from the top of a 200-m cliff. What is the average speed of the rock from $t = 1$ to $t = 2$?</p> <p>Ex. 2 Given $f(x) = 2\sin x + e^x$. Find the average rate of change on the interval $[-1, 4]$.</p> <p>Ex. 3 A bird drops a pebble from 2000 feet.</p> <ol style="list-style-type: none"> If the rock falls according to the law $y = 16t^2$, what is its average speed over the first 3 seconds? What is the average speed of the rock over the first 4 seconds? 5 seconds? What is the average speed of the rock from $t = 4$ seconds to $t = 4.1$ seconds? What is the average speed of the rock from $t = 4$ seconds to $t = 4.01$ seconds?
HOMEWORK		Worksheet 7

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/23	THE DERIVATIVE AND DIFFERENTIABILITY	<p>The Derivative at a Point: $f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$</p> <p>Alternate Form: $f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$</p> <p>Ex. 1 Find $\frac{dy}{dx}$ for $y = 3x^2 + 2x$ at $a = -1$.</p> <p>Ex. 2 Use the alternate form to find $f'(x)$ for $f(x) = x^3 - x$ at $a = -1$</p> <p>Ex. 3 Determine if $f(x) = \begin{cases} 3x^2 - 2x, & x \leq 1 \\ 4x - 3, & x > 1 \end{cases}$ is differentiable at $x = 1$.</p> <p>Ex. 4 Given the graph of $f(x)$, use left and right hand derivatives to prove that $f(x)$ is not differentiable at $x = 4$.</p>
HOMEWORK		Worksheet 8

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/26	RULES FOR DERIVATIVES - POWER RULE - PRODUCT RULE - QUOTIENT RULE	Ex. 1 $\frac{d}{dx}(5)$ Ex. 2 Find $\frac{dy}{dx}$ for $y = x^5$ Ex. 3 Find y' for $y = \frac{1}{\sqrt{x}}$ Ex. 4 For $y = x^2 + x - \sqrt[3]{x} + 5$, find y' . Ex. 5 Find $f'(x)$ for $f(x) = (x^2 - 2x + 1)(3x + 1)$ Ex. 6 Find y' for $y = \frac{x^4 - x + 4}{3x^2 - 2}$
HOMEWORK		Worksheet 9

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/27	HIGHER ORDER DERIVATIVES TANGENT AND NORMAL LINES	Ex. 1 For $y = x^4 - 2x^{-3} + x^2$, find $\frac{d^2y}{dx^2}$ Ex. 2 Find $\frac{d^4(x^7 - 4x^5)}{dx^4}$ Ex. 3 Find an equation for the line tangent to the curve $f(x) = x^3 + 2x^2 - 4x + 1$ at the point $(1, 6)$. Ex. 4 Determine the x -coordinates at which the graph of $y = x^3 - 2x^2 + x + 1$ has horizontal tangent lines.
HOMEWORK		Worksheet 10

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/28	DERIVATIVES OF TRIGONOMETRIC FUNCTIONS	Find $\frac{dy}{dx}$. Ex. 1 a) $y = \sin 6x$ b) $y = \sin(x^2 + 2x - 1)$ c) $y = \sin(\cos \sqrt{x})$ Ex. 2 a) $y = \frac{\cos x}{x^2}$ b) $y = \sin 4x \cos 4x$ c) $y = \frac{3x}{\cos x}$ Ex. 3 a) $y = x^5 + \sqrt{x} - \tan 5x$ b) $y = \frac{\tan x}{x}$ c) $y = \csc(x^2)$
HOMEWORK		Worksheet 11

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/29	QUIZ	Quiz – Avg. ROC, Differentiability, Rules for Derivatives, Tangents and Normals
HOMEWORK		None

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
8/30	THE PACKAGE RULE	<p>Ex. 1 Differentiate $y = (3x^2 + 1)^2$</p> <p>Ex. 2 Find the derivative of $f(x) = (x^3 - 4x)^{\frac{3}{4}}$</p> <p>Ex. 3 Find $\frac{dy}{dx}$ for $y = \cos^4(3x^2 - 2x)$.</p> <p>Ex. 4 Find the equation of the tangent line to the graph of $f(x) = \frac{x}{(x^2 - 4)^2}$ at $x = 3$.</p>
HOMEWORK		Worksheet 12

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
9/3	REVIEW	None
HOMEWORK		Worksheet 13

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
9/4	UNIT 2 FRQ	FRQ – Limits and Continuity, Differentiation
HOMEWORK		Worksheet 14

DATE	CONCEPT	IN-CLASS SAMPLE PROBLEMS
9/5	UNIT EXAM	Good luck on today's exam
HOMEWORK		None