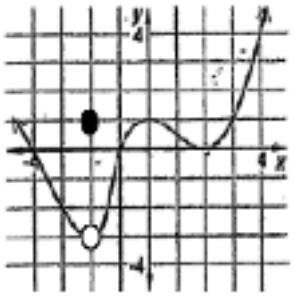
Chapter 15: Derivatives
What you need to KNOW

Big Idea	What you use	An example
Know the limit definition of a derivative		Find the formula for the slope of a secant line from time x to time x+Δx for the function $f(x) = 2x - 3$. Show work.
Know some basic physics	If you see "average velocity from time a to time b", then that is the slope, the average rate of change between given points. Position Instantaneous Velocity Instantaneous Acceleration	The height of an object at t seconds with initial velocity of 50 ft/sec is given by $h(t) = 50t - 16t^2$. a. find the average rate of change from time 2 seconds to 4 seconds b. What is the formula for instantaneous velocity of the object? Use the formula to find the velocity of the ball at 3 seconds. c. What is the formula for the instantaneous acceleration of the object? Use the formula to find the acceleration at 3 seconds. d. At what time does the object hit the ground? e. At what time does the object reach its maximum height?

Big Idea	What you use	An example
Write an equation for a tangent line for a function at a particular point		Write the equation of the tangent line for the function $f(x) = 2x^3 - 3x^2 - 10x \quad at\ x = 3.$ Show all work in determining this equation.
Read a graph to answer some basic questions about limits and rate of change		Given the function graphed below, find $f(-2)$ and $\lim_{x \to -2} f(x)$. Is $f(x)$ continuous at $x = -2$?  Find the average rate of change from x = -3 to x = 3.

Big Idea	What you use	An example
Derivative basics		Using your knowledge of derivatives, answer the following questions: a. What is a tangent line and what does it tell you? b. What is a secant line? c. What is instantaneous velocity and how do you find it? d. What is instantaneous acceleration and how do you find it? e. The derivative function is really the _____ function of the original function. f. The _____ of the derivative are the _____ points of the original function. Given the function $f(x) = 6x^7 - 9x^4 + 3x^2 + 2$, find $f'(x)$ and $f''(x)$.
Product Rule		$f(x) = (2x - 4)\sin x$

Big Idea	What you use	An example
Quotient Rule		$f(x) = \frac{2x-7}{e^x}$
~~Product and Quotient Rule~~	**Skip this row**	$y = \frac{xe^x}{x^2+2}$

Big Idea	What you use	An example
Chain Rule		$f(x) = \cos(x^2 - 4)$ $f(x) = \ln(5x^3 - 2x + 8)$