$y = a \cdot x^n$

$y' = (n \cdot a)\, x^{n-1}$

Today's Topic: The Power Rule – In the next few weeks we will be learning how to find the derivative of a number of different types of functions. Today, we will look at constant functions and functions that involve $a \cdot x^n$.

Remember: Finding the derivative means that we are finding the slope of a function.

In-class examples:

Differentiate each function. Label each function appropriately (i.e. y' = ___ or $f'(x)$ = ____)

Ex. 1 a) $y = 3x^2 + 2x - 1$

$y' = 6x + 2$

b) $s(t) = -4.9t^2 + 120t + 80$

$s'(t) = -9.8t + 120$

c) $f(x) = 4\sqrt{x} - \dfrac{1}{x}$

$f(x) = 4x^{1/2} - x^{-1}$

$f'(x) = 2x^{-1/2} + x^{-2}$

$f'(x) = \dfrac{2}{\sqrt{x}} + \dfrac{1}{x^2}$

d) $h(t) = -5t^{-3} + \dfrac{3}{\sqrt[3]{t^4}} - 5t + 4$

$h(t) = -5t^{-3} + 3t^{-4/3} - 5t + 4$

$h'(t) = 15t^{-4} - 4t^{-7/3} - 5$

Ex. 2 Find the slope of $f(x) = x^3 + 3x - 1$ at $x = 2$.

$f'(x) = 3x^2 + 3$

$f'(2) = 15$

Tangent Line

point	slope
(2, 13)	$f'(2) = 15$

T: $y - 13 = 15(x - 2)$

Normal Line : $y - 13 = -\frac{1}{15}(x - 2)$

AP Multiple Choice

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

(A) 10 (B) 9 (C) 7 (D) 5 (E) 3

$f'(x) = 3x^2 - 2x + 1$

$f'(2) = 9$

If $f(x) = \sqrt{x} + \frac{3}{\sqrt{x}}$, then $f'(4) =$

(A) $\frac{1}{16}$ (B) $\frac{5}{16}$ (C) 1 (D) $\frac{7}{2}$ (E) $\frac{49}{4}$

$f(x) = x^{1/2} + 3x^{-1/2}$

$f'(x) = \frac{1}{2}x^{-1/2} - \frac{3}{2}x^{-3/2}$

$= \frac{1}{2\sqrt{x}} - \frac{3}{2\sqrt{x^3}}$

$f'(4) = \frac{1}{4} - \frac{3}{2(8)} = \frac{4}{16} - \frac{3}{16} = \frac{1}{16}$

Homework: Worksheet 22