

Unit #7: Differentiation

Topic: The Power Rule

Objective: SWBAT find the formula for the derivative of a function by using the power rule.

Warm Up #1:

Find the slope of the graph $f(x) = \frac{x^3}{6}$ when $x = -1$.



Would you like to see a shortcut??

There are several rules of differentiation that will allow us to find the derivatives of functions more efficiently.

Rule 1 The Constant Rule

The derivative, $\frac{dy}{dx}$, of a constant function is _____.

Rule 2 The Power Rule (You're gonna love this!!)

If n is a real number and a is some constant in the function $f(x) = ax^n$, then

$$\frac{d}{dx} [ax^n] = \underline{\hspace{2cm}}$$

Examples:

1) Find the derivative for each of the following functions.

a) $f(x) = 8$	b) $g(x) = 2x^3$	c) $y = \frac{\sqrt[3]{x}}{3}$	d) $h(x) = \frac{6}{\sqrt[5]{x^3}}$
---------------	------------------	--------------------------------	-------------------------------------

2) Find the equation of the tangent line to the graph of $f(x) = -3x^2$ when $x = -1$.

Rule 3 The Sum and Difference Rules

$$\frac{d}{dx} [f(x) + g(x)] = \underline{\hspace{2cm}} \quad \frac{d}{dx} [f(x) - g(x)] = \underline{\hspace{2cm}}$$

Examples:

3) Find the derivative for each of the following

a) $f(x) = x^3 - 4x + 5$

b) $g(x) = -\frac{x^4}{2} + 2x^3 - 5x$

Simplifying and or rewriting becomes **EXTREMELY IMPORTANT** when using the Power Rule.

$$c) y = x(3x + 2)^2$$

$$d) h(x) = \frac{2x^3 - 3x^2 + 7x + 5}{2\sqrt{x}}$$

Problem Set #1:

Find the derivative for each of the following functions.

1) $f(x) = -2x^3 - x^2 + 4x - 7$	2) $y = 4x^2(3 - 2x)^2$
3) $g(x) = \frac{2}{x^2}$	4) $f(x) = 10x^7 + 2x^{-1} - 3x^{-2}$
5) $h(x) = \frac{3x^4 - 2x^3}{2x^2}$	6) $y = 3x^2 - \frac{2}{\sqrt{x}} + \frac{5}{x^2}$

$$7) f(x) = \frac{x^3}{3} + \frac{x^2}{2} + x$$

$$8) y = -2\sqrt[3]{x} - \frac{3}{x} + 2$$

$$9) g(x) = \frac{x^{-4}}{4} - \frac{x^{-3}}{3} + \frac{x^{-2}}{2} - x^{-1} + 3$$

$$10) h(x) = 2\sqrt{x} - \frac{1}{\sqrt{x}}$$

$$11) y = \frac{x+1}{x}$$

$$12) f(x) = 1 - x + x^2 - x^3$$

$$13) \text{ Find } f'(-1) \text{ if } f(x) = \frac{1}{2}x^4 - \frac{1}{3}x^3 + 5x + 4.$$

$$14) \text{ Find the equation of the tangent line to the graph } f(x) = (x^2 + 2x)(x + 1) \text{ at } x = 1.$$

