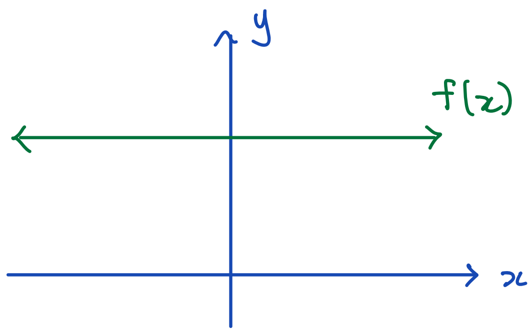
Name: ___________________________ Date: ____________________

Learning Goal 3.1	Using all basic derivative rules.

Constant Rule

$f(x) = 8$

$f'(x) = 0$



if $f(x) = c$ where $c \in \mathbb{R}$, then $f'(x) = 0$

Power Rule

$f(x) = x$ $\quad f'(x) = 1$

$f(x) = x^2$ $\quad f'(x) = 2x$

$f(x) = x^3$ $\quad f'(x) = 3x^2$

$f(x) = x^4$ $\quad f'(x) = 4x^3$

$f(x) = x^5$ $\quad f'(x) = 5x^4$

if $f(x) = x^n$ then $f'(x) = nx^{n-1}$

Example Use different notations to represent the derivatives of the following.

a. $f(x) = x^6$

$f'(x) = 6x^{6-1}$

$= 6x^5$

b. $y = x^{1000}$

$\frac{dy}{dx} = 1000x^{999}$

c. $v = s^3$

$v' = 3s^2$

d. $\frac{d}{dr}(r^4)$

$= 4r^3$

e. $f(x) = \frac{1}{x^2}$

$= x^{-2}$

$f'(x) = -2x^{-3}$

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

f. $y = \sqrt[3]{x^2}$

$y = x^{2/3}$

$y' = \frac{2}{3}x^{-1/3}$

$= \frac{2}{3\sqrt[3]{x}}$

$= \frac{2\sqrt[3]{x^2}}{3x}$

g. $f(x) = x\sqrt{x}$

$= x^{3/2}$

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

$= \frac{3\sqrt{x}}{2}$

Assignment # 3 – 15, 19 – 29, 34, 36, 45, 47 Quiz Next Day!

Constant Multiple Rule

$y = cf(x)$

$\frac{dy}{dx} = cf'(x)$

Sum and Difference Rule

$\frac{d}{dx}\left(f(x) \pm g(x) \pm h(x) \pm \dots\right)$

$= f'(x) \pm g'(x) \pm h'(x) \pm \dots$

Example

a. $f(x) = 3x^4$

$f'(x) = 3(4x^3)$

$= 12x^3$

b. $\frac{d}{dx}(-x)$

$= -\frac{d}{dx}x^1$

$= -1x^0$

$= -1$

c. $\frac{d}{dx}\left(x^4 - 10x^3 + 6x + 5\right)$

$= \frac{d}{dx}x^4 - \frac{d}{dx}10x^3 + \frac{d}{dx}6x + \frac{d}{dx}5$

$= 4x^3 - 30x^2 + 6$

d. $y = \sqrt{x}(x - 1)$

$= x^{3/2} - x^{1/2}$

$y' = \frac{3}{2}x^{1/2} - \frac{1}{2}x^{-1/2}$

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

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

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

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

all legitimate answers

Example Find the equation of the tangent line to the curve $y = (1 + 2x)^2$ at $(1, 9)$.

$y = (1+2x)(1+2x)$

$= 1 + 4x + 4x^2$

$y' = 4 + 8x$

at $x = 1$, $y' = 4 + 8$

$= 12$ ← slope of the tangent

$y - 9 = 12(x-1)$

$= 12x - 12$

$y = 12x - 3$

$= 3(4x-1)$ ← weird

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