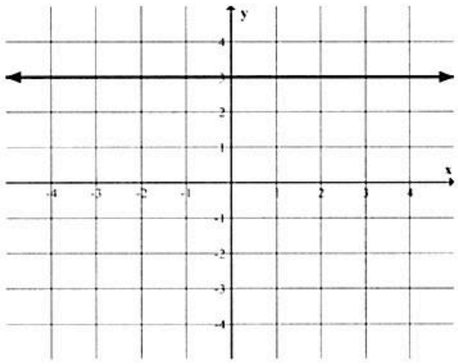
Notes on 3.2

AB Calculus

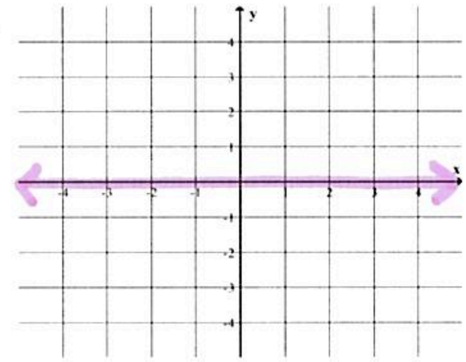
name Key

Use the given function to sketch a graph of the derivative.

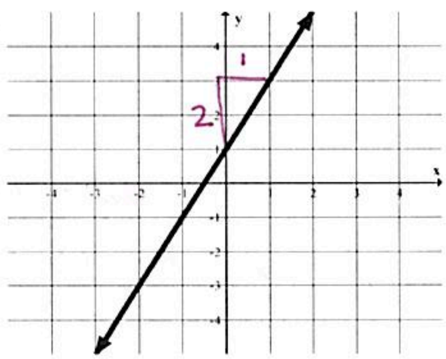
$f(x) = 3$



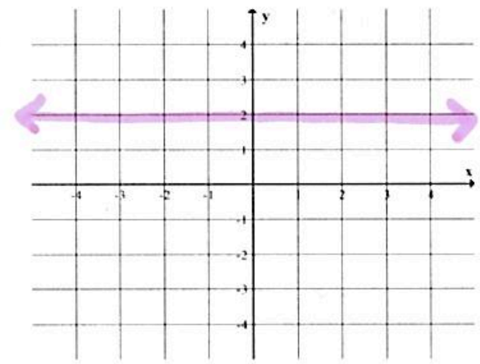
$f'(x) =$ 0



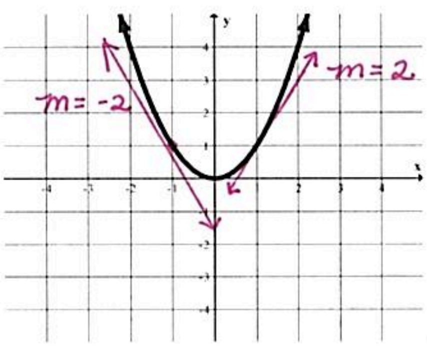
$g(x) = 2x+1$



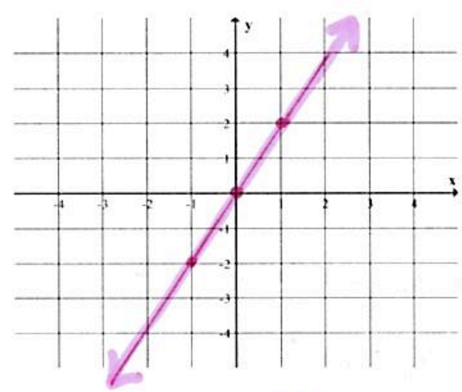
$g'(x) =$ 2



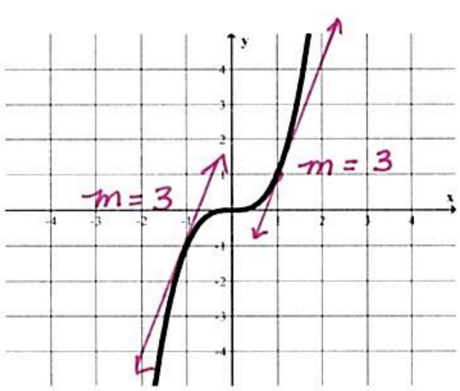
$h(x) = x^2$



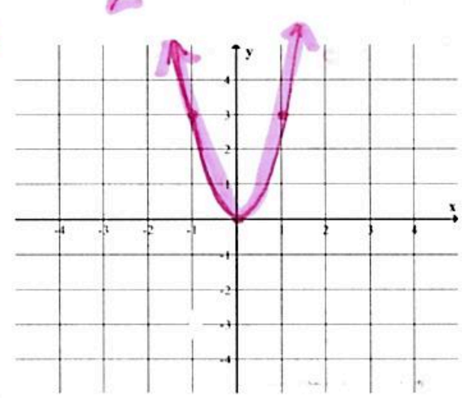
$h'(x) =$ $2x$



$j(x) = x^3$



$j'(x) =$ $3x^2$



Do you notice a pattern? power drops to the front + then reduces by 1 degree

Power Rule:

$f(x) = x^{n}$ $^{-1}$ $\longrightarrow$ $f'(x) = nx^{n-1}$

In general,

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

This will **NOT** be true for multiplication and division of functions.

Examples: Find the derivatives.

a) $f(x) = x^5$

$f' = 5x^4$

b) $y = \sqrt[4]{x^3} = x^{3/4}$

$y' = \frac{3}{4} x^{-1/4}$

$y' = \frac{3}{4\sqrt[4]{x}}$

c) $g(x) = 3x^2 - 2x + 1$

$g' = 6x - 2$

d) $h(x) = \frac{x^3 - 2x}{x} = x^2 - 2$

$h' = 2x$

e) $x(x^3 - 2x)$

$\frac{d}{dx}(x^4 - 2x^2) =$

$4x^3 - 4x$

f) $j(x) = (2x-3)^2 = 4x^2 - 12x + 9$

$j'(x) = 8x - 12$

Equation of a tangent line at $x = a$: $y - f(a) = f'(a)(x - a)$

Example: Find the equation of the line tangent to $f(x) = x^3 - 2x + 1$ at x = 3.

$f(3) = 27 - 6 + 1 = 22$

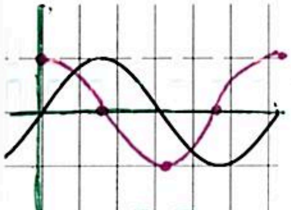
$f'(x) = 3x^2 - 2$

$f'(3) = 3 \cdot 9 - 2 = 25$

$y - 22 = 25(x - 3)$

Derivatives of other Functions:

y=sin x



$y' = \cos x$

y=cos x

$y' = -\sin x$

$y = e^x$

$y' = e^x$

$y = a^x$

$y' = a^x \cdot \ln a$