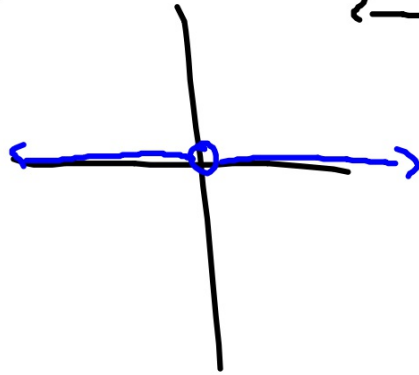
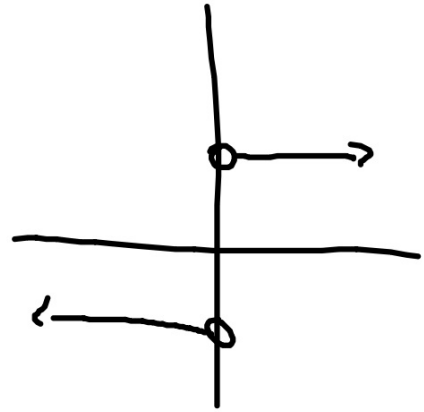
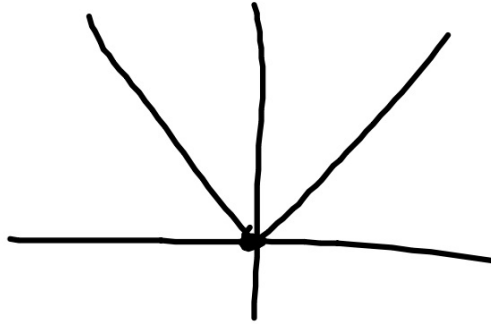
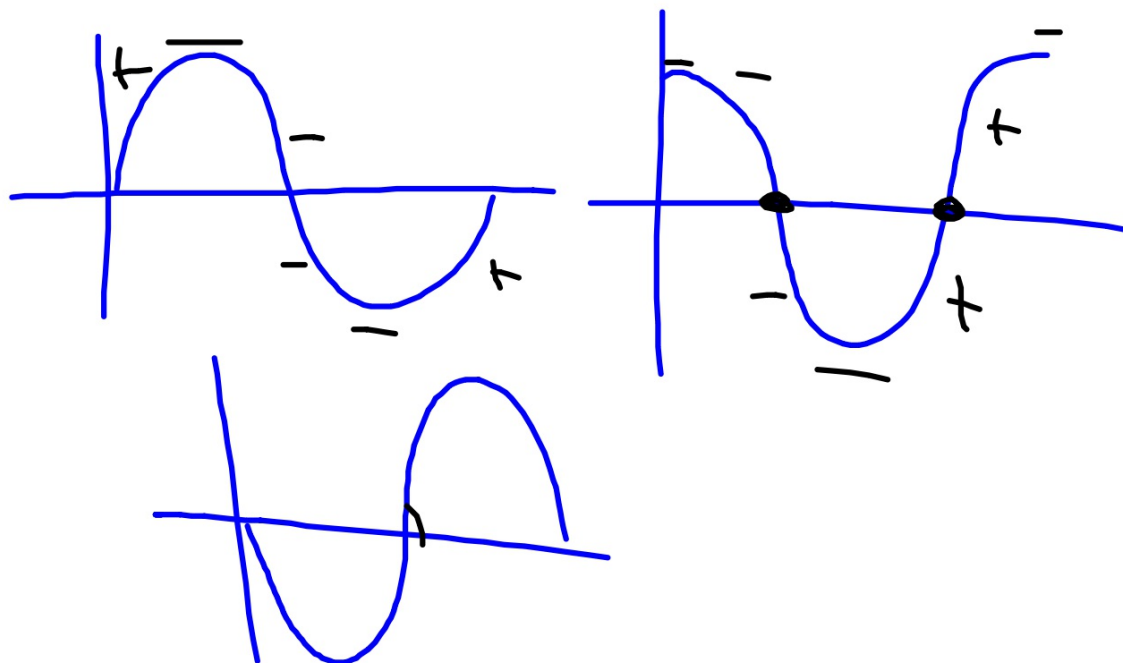


7.



5.



## 2.4 The Chain Rule

A.  $f(x) = (3x^2 - 5)^2$

$$(3x^2 - 5)(3x^2 - 5)$$

$$6x(3x^2 - 5) + 6x(3x^2 - 5)$$

$$18x^3 - 30x + 18x^3 - 30x$$

$$\boxed{36x^3 - 60x}$$

$$f(x) = (3x^2 - 5)^2$$

$$2(3x^2 - 5)' \cdot 6x$$

$$12x(3x^2 - 5)$$

$$36x^3 - 60x$$

$$(3x^2 - 5)^{20}$$

$$20(3x^2 - 5)^{19} \cdot 6x$$

$$120x(3x^2 - 5)^{19}$$

1. Chain Rule -  $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

2. Derivative of "Inside" •

Derivative of "Outside"

3. Substitution - let  $u = \text{inside}$

$$y = (3x^2 - 5)^{20} \rightarrow 120x(3x^2 - 5)^{19}$$

$$u = 3x^2 - 5$$

$$y = u^{20}$$

$$\frac{du}{dx} = 6x$$

$$\frac{dy}{du} = 20u^{19}$$

$$6x \cdot 20u^{19}$$

$$120x(3x^2 - 5)^{19}$$

Ex.  $(5x-12)^{10}$

$$u = 5x - 12$$

$$y = u^{10}$$

$$\frac{du}{dx} = 5$$

$$\frac{dy}{du} = 10u^9$$

$$50u^9$$

$$50(5x-12)^9$$



$$\text{Ex. } \sqrt[3]{(x^2-1)^2} = (x^2-1)^{2/3}$$

$$u = x^2 - 1$$

$$y = u^{2/3}$$

$$\frac{du}{dx} = 2x$$

$$\frac{dy}{du} = \frac{2}{3} u^{-1/3}$$

$$\frac{4}{3} x (x^2-1)^{-1/3}$$

$$\text{Ex. } (4x^2 - 2x + 6)^{3/4}$$

$$U = 4x^2 - 2x + 6 \quad y = U^{3/4}$$

$$\frac{du}{dx} = 8x - 2$$

$$\frac{dy}{dx} = \frac{3}{4} u^{-1/4}$$

$$(8x - 2) \left(\frac{3}{4}\right) (4x^2 - 2x + 6)^{-1/4}$$







