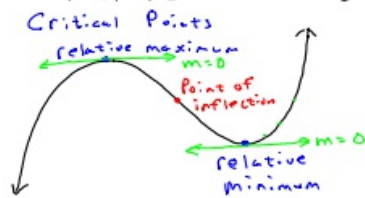
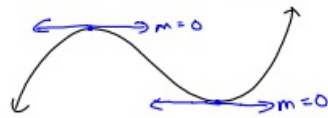


1-11-18 1<sup>st</sup> Trig



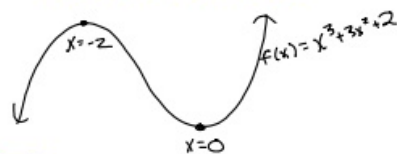
- ① Find critical points of  
 $f(x) = x^3 + 3x^2 + 2$



- ① Take derivative of function  
 $f'(x) = 3x^2 + 6x$
- ② I want to know when slope is 0.  $\therefore$  set derivative equal to 0.

$$3x^2 + 6x = 0$$
$$3x(x+2) = 0$$
$$3x = 0 \quad \text{OR} \quad x+2 = 0$$
$$x = 0 \quad \quad \quad \underline{-2 \quad -2}$$
$$x = -2$$

I know slope is 0 when  
 $x=0$  and when  $x=-2$ .



- ③ Find y value that goes with these x values by plugging the x values into the original equation.

$$x=0 \quad f(0) = 0^3 + 3(0)^2 + 2$$
$$= 2$$

$(0, 2)$   $\leftarrow$  relative minimum

$$x=-2 \quad f(-2) = (-2)^3 + 3(-2)^2 + 2$$
$$= 6$$

$(-2, 6)$   $\leftarrow$  relative maximum

Point of Inflection is found by taking the 2<sup>nd</sup> derivative

$$f'(x) = 3x^2 + 6x$$

$$f''(x) = 6x + 6$$

$$\underline{\underline{6x + 6 = 0}}$$

$$6x = -6$$

$$x = -1$$

Plug  $x=-1$  into original equation

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

$$= 4$$

$(-1, 4)$   $\leftarrow$  point of inflection

② Find the critical points of  $f(x) = x^3 + 9x^2 - 8$

①  $f'(x) = 3x^2 + 18x$

$$3x^2 + 18x = 0$$

$$3x(x+6) = 0$$

$$3x = 0$$

$$x = 0$$

$$x+6 = 0$$

$$x = -6$$



②  $f(0) = 0^3 + 9(0)^2 - 8$

$$= -8$$

$(0, -8) \leftarrow$  relative minimum

$$f(-6) = (-6)^3 + 9(-6)^2 - 8$$

$$= 100$$

$(-6, 100) \leftarrow$  relative maximum

### Point of Inflection

$$f'(x) = 3x^2 + 18x$$

$$f''(x) = 6x + 18$$

$$6x + 18 = 0$$

$$\frac{-18 \quad -18}{\quad \quad \quad}$$

$$6x = -18$$

$$x = -3$$

$$f(-3) = (-3)^3 + 9(-3)^2 - 8$$

$$= 46$$

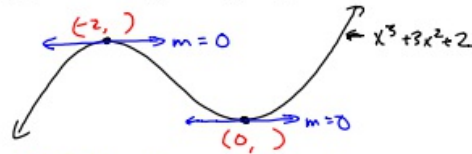
$(-3, 46) \leftarrow$  point of inflection

1-11-18 3<sup>rd</sup> Trig

## Critical Points



①  $f(x) = x^3 + 3x^2 + 2$



- ① Take the derivative and set it equal to 0.

$$f'(x) = 3x^2 + 6x$$

$$3x^2 + 6x = 0$$

$$3x(x+2) = 0$$

$$3x = 0 \quad x+2 = 0$$

$$x = 0 \quad x = -2$$

- ② Plug our  $x$  values into the original equation to find the  $y$  value that goes with it.

$$x=0 \quad f(0) = 0^3 + 3(0)^2 + 2$$

$$= 2$$

$(0, 2) \leftarrow$  relative minimum

$$x=-2 \quad f(-2) = (-2)^3 + 3(-2)^2 + 2$$

$$= 6$$

$(-2, 6) \leftarrow$  relative maximum

## Point of Inflection

Take the 2<sup>nd</sup> derivative and set it = to 0.

$$f'(x) = 3x^2 + 6x$$

$$f''(x) = 6x + 6$$

$$6x + 6 = 0$$

$$\begin{array}{r} -6 \quad -6 \\ \hline 6x = -6 \end{array}$$

$$x = -1$$

Plug  $x = -1$  into original equation to get the  $y$  value.

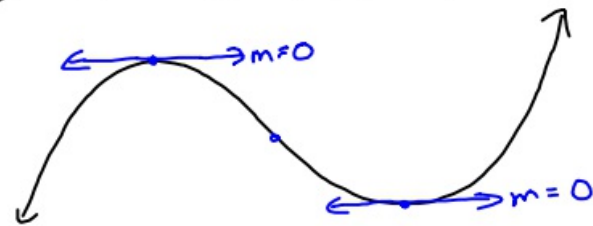
$$f(x) = x^3 + 3x^2 + 2$$

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

$$= 4$$

$(-1, 4) \leftarrow$  point of inflection

$$\textcircled{2} f(x) = x^3 + 9x^2 - 8$$



$$\textcircled{1} f'(x) = 3x^2 + 18x$$

$$3x^2 + 18x = 0$$

$$3x(x+6) = 0$$

$$3x = 0 \quad x+6 = 0$$

$$x = 0 \quad x = -6$$

$$\textcircled{2} f(x) = x^3 + 9x^2 - 8$$

$$f(0) = 0^3 + 9 \cdot 0^2 - 8 = -8$$

$(0, -8) \leftarrow \text{rel. minimum}$

$$f(-6) = (-6)^3 + 9(-6)^2 - 8$$

$$= 100$$

$(-6, 100) \leftarrow \text{relative max}$

### Point of Inflection

$$f(x) = x^3 + 9x^2 - 8$$

$$f'(x) = 3x^2 + 18x$$

$$f''(x) = 6x + 18$$

$$6x + 18 = 0$$

$$\begin{array}{r} -18 \\ -18 \end{array}$$

$$\hline 6x = -18$$

$$x = -3$$

$$f(-3) = (-3)^3 + 9(-3)^2 - 8$$

$$= 46$$

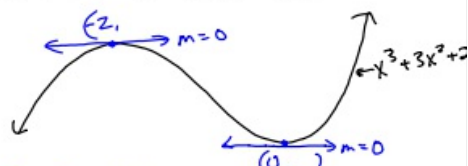
$(-3, 46) \leftarrow \text{point of inflection}$

1-11-18 4<sup>th</sup> Trig

## Critical Points



①  $f(x) = x^3 + 3x^2 + 2$



- ① Find derivative and set it equal to 0.

$$f'(x) = 3x^2 + 6x$$

$$3x^2 + 6x = 0$$

$$3x(x+2) = 0$$

$$3x = 0$$

$$x = 0$$

$$x+2 = 0$$

$$\frac{-2}{-2} = \frac{-2}{-2}$$

$$x = -2$$

- ② Plug your x values into the original equation.

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

$$x=0 \quad f(0) = 0^3 + 3(0)^2 + 2 = 2$$

$(0, 2) \leftarrow$  relative minimum

$$x=-2 \quad f(-2) = (-2)^3 + 3(-2)^2 + 2 = 6$$

$(-2, 6) \leftarrow$  relative maximum

## Point of Inflection

- ① Take the derivative of the derivative and set it = 0.

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

$$f'(x) = 3x^2 + 6x$$

$$f''(x) = 6x + 6$$

$$6x + 6 = 0$$

$$\frac{-6}{-6} = \frac{-6}{-6}$$

$$6x = -6$$

$$x = -1$$

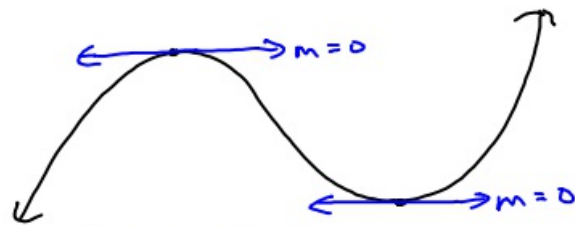
Plug the x into the original equation.

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

$$= 4$$

$(-1, 4) \leftarrow$  point of inflection

$$\textcircled{2} f(x) = x^3 + 9x^2 - 8$$



$$f'(x) = 3x^2 + 18x$$

$$3x^2 + 18x = 0$$

$$3x(x+6) = 0$$

$$3x = 0$$

$$x = 0$$

$$x+6 = 0$$

$$x = -6$$

$$x=0 \quad f(x) = x^3 + 9x^2 - 8$$

$$f(0) = 0^3 + 9 \cdot 0^2 - 8$$

$$= -8$$

$(0, -8) \leftarrow$  rel. minimum

$$x=-6 \quad f(-6) = (-6)^3 + 9 \cdot (-6) - 8$$

$$= 100$$

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$(-6, 100) \leftarrow$  relative  
maximum

Point of Inflection

$$f(x) = x^3 + 9x^2 - 8$$

$$f'(x) = 3x^2 + 18x$$

$$f''(x) = 6x + 18$$

$$6x + 18 = 0$$

$$x = -3$$

$$f(x) = x^3 + 9x^2 - 8$$

$$f(-3) = (-3)^3 + 9 \cdot (-3)^2 - 8$$

$$46$$

$(-3, 46) \leftarrow$  point of inflection