Today's Plan:

Learning Target (standard): I will use the 2nd derivative test to describe the characteristics of a function.

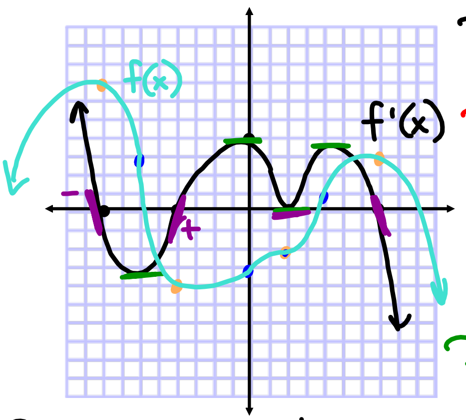
Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Use the 1st & 2nd derivative tests to describe f(x) based on the graph of f(x). Use the information to sketch a possible f(x).



$D_{f(x)}: \mathbb{R}$

$D_{f'(x)}: \mathbb{R}$

Critical #s:
$x = -8, -4, 2, 7$

Possible POIs:
$x = -6, 0, 2, 4$

Domain Interval	$f'(x)$	$f(x)$	
$(-\infty, -8)$	+	increasing	
			> max @ $x = -8$
$(-8, -4)$	−	decreasing	
			> min @ $x = -4$
$(-4, 2)$	+	increasing	
			> glitch @ $x = 2$
$(2, 7)$	+	increasing	
			> max @ $x = 7$
$(7, \infty)$	−	decreasing	

Domain Interval	$f''(x)$	Concavity of $f(x)$	
$(-\infty, -6)$	−	down	
			> POI @ $x = -6$
$(-6, 0)$	+	up	
			> POI @ $x = 0$
$(0, 2)$	−	down	
			> POI @ $x = 2$
$(2, 4)$	+	up	
			> POI @ $x = 4$
$(4, \infty)$	−	down	

Extrema:

$f''(-8) < 0$ max @ $x = -8$

$f''(-4) > 0$ min @ $x = -4$

$f''(2) = 0 \rightarrow$ see 1st Derivative Test

$f''(7) < 0$ max @ $x = 7$

Use the 1st Derivative Test to describe the behavior of the function.

$$f(x) = x^2 - 2x - 3 \quad D: \mathbb{R}$$

$$f'(x) = 2x - 2 \quad D: \mathbb{R}$$

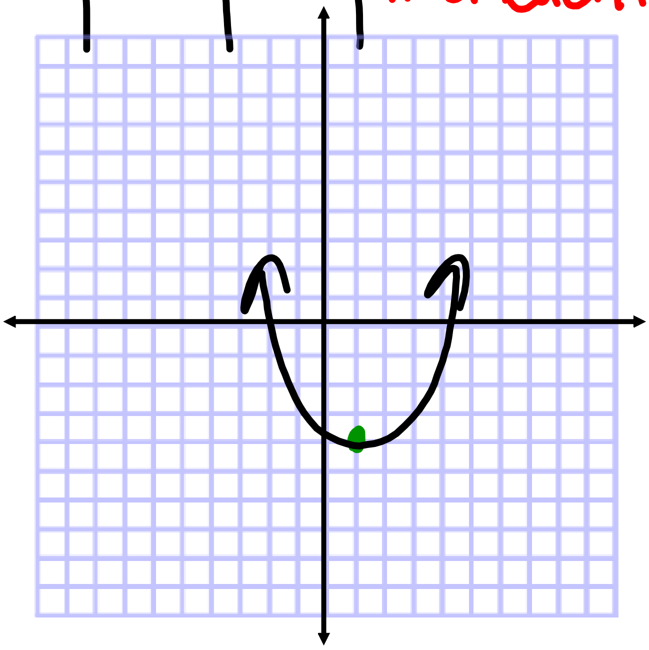
$$0 = 2(x-1)$$

Critical #:

$$x = 1$$

Domain Interval	2	x-1	f'(x)	f(x)
$(-\infty, 1)$	+	−	−	decreasing
$(1, \infty)$	+	+	+	increasing

min = −4 @x = 1



Use the 2nd Derivative Test to analyze the function.

$f(x) = x^3 - 2x^4$ D: $\mathbb{R}$

$f'(x) = 3x^2 - 8x^3$ D: $\mathbb{R}$

$0 = x^2(3 - 8x)$

Critical #s:

$x = 0, \frac{3}{8}$

$f''(x) = 6x - 24x^2$

$0 = 6x(1 - 4x)$

Possible POIs:

$x = 0, \frac{1}{4}$

$f(\frac{1}{4}) = \frac{1}{64} - 2(\frac{1}{256})$

$= \frac{1}{64} - \frac{1}{128}$

$= \frac{2}{128} - \frac{1}{128}$

$f(\frac{1}{4}) = \frac{1}{128}$

Domain Interval	$6x$	$1-4x$	$f''(x)$	Concavity $f(x)$
$(-\infty, 0)$	−	+	−	down
$(0, \frac{1}{4})$	+	+	+	up
$(\frac{1}{4}, \infty)$	+	−	−	down

> POI @ $(0, 0)$

> POI @ $(\frac{1}{4}, \frac{1}{128})$

Extrema:

$f''(0) = 0 \rightarrow$ see 1st Derivative Test

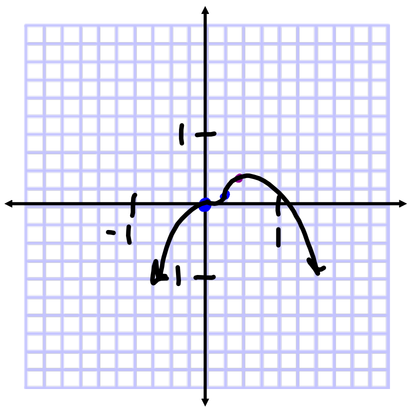
$f''(\frac{3}{8}) < 0$ max $= \frac{27}{2048}$ @ $x = \frac{3}{8}$

$f(\frac{3}{8}) = (\frac{3}{8})^3 - 2(\frac{3}{8})^4$

$f(\frac{3}{8}) = \frac{27}{2048}$

Domain Interval	x^2	$3-8x$	$f'(x)$	$f(x)$
$(-\infty, 0)$	+	+	+	increasing
$(0, \frac{3}{8})$	+	+	+	increasing

> glitch = 0 @ $x = 0$



Use the 1st Derivative Test to analyze the function:

$$1)\, f(x) = -\frac{x^2}{2} + x + \frac{1}{2}$$

QUIZ tomorrow!

$$2)\, f(x) = -\frac{x^3}{3} + \frac{x^2}{3} + \frac{8x}{3}$$

Use the 2nd Derivative Test to analyze the function:

$$3)\, f(x) = -\frac{x^4}{8} + \frac{x^2}{2} - \frac{1}{2}$$

$$4)\, f(x) = \frac{x^3}{3} - \frac{2x^2}{3} - \frac{4x}{3}$$