Today's Plan:

Learning Target (standard): I will use the 1st 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.

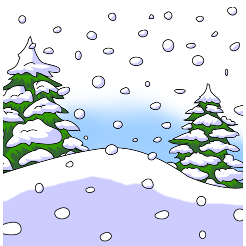
Assessment: Board work, homework check and homework assignment

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.

p.150 #1-6 * Use the 1st Derivative Test *

* Pick any two to write the explanations of the 1st Derivative Test *

We will be putting these problems up on the board and we will check them that way!



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

$f(x) = x^{\frac{1}{3}}(8-x)$ D: ℝ

$f(2) = 2^{\frac{1}{3}}(8-2)$

$f(2) = 6\sqrt[3]{2}$

$f'(x) = \frac{1}{3}x^{-2/3}(8-x) - x^{\frac{1}{3}}$ D: $\{x \mid x \neq 0\}$

$f'(x) = \frac{1}{3}x^{-\frac{2}{3}}[8 - x - 3x]$ Critical #s: $x = 0, 2$

$\frac{x^{\frac{1}{3}}}{\frac{1}{3}x^{-\frac{2}{3}}} = 3x^{\frac{1}{3}} \cdot x^{\frac{2}{3}} = 3x$

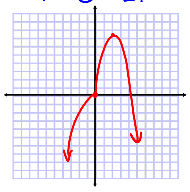
$f'(x) = \frac{1}{3}x^{-\frac{2}{3}}(8-4x)$

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

Domain Interval	$8-4x$	$3x^{\frac{2}{3}}$	$f'(x)$	$f(x)$
$(-\infty, 0)$	+	+	+	increasing > cusp/glitch = 0 @ x=0
$(0, 2)$	+	+	+	increasing > max = $6\sqrt[3]{2}$ @ x=2
$(2, \infty)$	−	+	−	decreasing

∴ Since $f'(x)$ is undefined @ x=0, but f(x) is defined, f(x) will have a cusp @ x=0. And because f'(x) goes from positive to positive @ x=0, f(x) goes from increasing to increasing @ x=0 and will have a glitch of 0 @ x=0.

Since f'(x) goes from positive to negative @ x=2, f(x) goes from increasing to decreasing @ x=2 and will have a maximum of $6\sqrt[3]{2}$ @ x=2.



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

$f(x) = \sqrt{x} - \frac{1}{2}x^2$ D: $\{x \mid x \geq 0\}$

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

$f'(x) = \frac{1}{2}x^{-\frac{1}{2}} - x$ D: $\{x \mid x > 0\}$

$= \frac{1}{2}x^{-\frac{1}{2}}(1 - 2x^{\frac{3}{2}})$ Critical #s: $X = 0, \frac{\sqrt[3]{2}}{2}$

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

$1 - 2\sqrt{x^3} = 0$

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

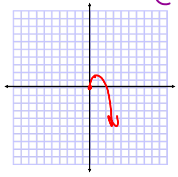
$(\sqrt{x^3})^2 = \left(\frac{1}{2}\right)^2$

$\sqrt[3]{x^3} = \sqrt[3]{\frac{1}{4}} \cdot \sqrt[3]{\frac{2}{2}}$

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

Domain Interval	$1-2\sqrt{x^3}$	$2\sqrt{x}$	$f'(x)$	$f(x)$
$(0, \frac{\sqrt[3]{2}}{2})$	+	+	+	increasing > max = .595 @ x = $\frac{\sqrt[3]{2}}{2}$
$(\frac{\sqrt[3]{2}}{2}, \infty)$	−	+	−	decreasing

∴ Since f(x) is defined @ x=0, but f'(x) is not, f(x) will have a cusp @ x=0. In addition, since f'(x) goes from positive to negative @ $x = \frac{\sqrt[3]{2}}{2}$, f(x) goes from increasing to decreasing @ $x = \frac{\sqrt[3]{2}}{2}$ and will have a maximum of 0.595 @ $x = \frac{\sqrt[3]{2}}{2}$.



Assignment:

p.150 #8-14 even

* Use the 1st Derivative Test *

* Pick any two to write the explanations of the 1st Derivative Test *

p.150 Derivatives

$$8)\ f'(x)=\frac{16-5x}{3x^{\frac{1}{3}}}$$

$$10)\ f'(x)=\frac{4-2x^2}{\sqrt{4-x^2}}$$

$$12)\ f'(x)=12x^2\left(-x+1\right)$$

$$14)\ f'(x)=\frac{2-2x}{3\sqrt[3]{\left(x^2-2x+1\right)^2}}$$