October 11

If the derivative is positive until $x = 2$ and negative after $x = 2$, describe what the function looks like. Justify your answer.

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Students will verbally explain how to use the derivative to give characteristics of a function

(using the words:
increasing, decreasing, positive, negative, zero...)

When does a function have a maximum?

When the derivative is zero or undefined and changes from positive to negative

critical point

When does a function have a minimum?

When the derivative is zero or undefined (critical point) and changes from negative to positive

Find all extrema:
$y = 6x^3 - 6x^4 + 5$

① find the derivative

$$y' = 18x^2 - 24x^3$$

② find critical points ($y'=0$ or undefined)

$$0 = 18x^2 - 24x^3$$

$$0 = 6x^2(3-4x)$$

$$\frac{0}{6} = \frac{6x^2}{6} \qquad 0 = 3-4x$$

$$\qquad\qquad +4x \quad +4x$$

$$\sqrt{0} = \sqrt{x^2} \qquad \frac{4x}{4} = \frac{3}{4}$$

$$0 = x \qquad x = \frac{3}{4}$$

③ create a table

crit pts		0	$\frac{3}{4}$
sign f'	$+$	$+$	$-$
behavior f	inc	inc	dec

④ test pts to find the sign of f'

$$y' = 18x^2 - 24x^3 = 6x^2(3-4x)$$

test pt $< 0 \rightarrow x = -1 \rightarrow 6(-1)^2(3-4(-1))$

$(+)(+)(+) =$ positive

test $0 < \text{pt} < \frac{3}{4} \rightarrow x = \frac{1}{2} \rightarrow 6\left(\frac{1}{2}\right)^2\left(3-4\left(\frac{1}{2}\right)\right)$

$(+)(+)(+) =$ positive

test pt $> \frac{3}{4} \rightarrow x = 1 \rightarrow 6(1)^2(3-4(1))$

$(+)(+)(-) =$ negative

⑤ fill the behavior of f + interpret

$\Rightarrow$ max at $x = \frac{3}{4}$

Name: ____

For each statement:

- Mark the box if it is true
- Rewrite the statement if it is incorrect.

Statement	True	Rewritten
When the function is negative, the derivative decreases.		
linear functions have derivatives that are constant unless a change happens and a dicontinuity happens		
A function has a derivative if its graph at a point gradually straightens.		
you can set the derivative to 0 to equal the horizontal		
derivatives show the instantaneous rate of the function		
the deriv. of position is the velosity		
i know that yuo can find the instantaneous rate of change of a function by finding the derivative		
you can take numerous derivatives from a function.		
if function is linear derivative is constant		
acceleration is the 3rd derivative of a function		
set derivative to 0 and find horizontal line and functions can be used to find derivative		
derivatives show the velocity of the function		
if the derivative involves multiplication yuo must use the product rule		
that the function show the first derivative		

that the derivative determines the function of the graph		
functions have a relationship with derivates, a derivative tells you the slope of the graph at one point,also the instantaneos rate of change		
The slope of a function is found by solving the derivative.		
speed is never negative		
when you have a function you can take the derivative inorer to fin the slope.		
fnnctions can be represented by velocity while the derivative is how fast the velocity is accelerating		
when the function is inc. the deriv. is positive.		
The function and the derivative have the same critical points.		
derivatives show the instantaneous rate of the function		
derivatives show intanteneous rate of change		
when functions are constant their derivatives are zero. derivatives detemine if the function is neghtive or positive		
when the derivative is negative the graph of the function is decreasing same for the opposite		
if the derivative is negative than the function of the graph is decreasing and if the derivative is positive than the function io increasing.		

Find all extrema:

$$f(x) = 4x^2 - 4x + 1$$

$$f(x) = 2x^3 - 3x^2 - 12x - 1$$

Find all extrema:

$$f(x) = \left(x^2 - 2\right)^{2/3}$$

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