October 23

When using the first derivative test,
(the table)
What numbers should you use and what equation do you use to find the sign of the derivative?

October 21

Students will verbally explain how to use the derivative to give characteristics of a function
(using the words:
concavity, increasing, decreasing, positive, negative, zero...)

What does the first derivative tell you about a function?

- Slope of function
- velocity
- if the function is increasing (derivative is positive)
- if the function is decreasing (derivative is negative)
- critical points $(f'(x)=0)$
  → minimums / maximums

What does the second derivative tell you about a function?

- acceleration
- concavity
  → if $f''(x)$ is positive, $f(x)$ is concave up + +
  → if $f''(x)$ is negative, $f(x)$ is concave down − −
- inflection point
  → where $f''(x)=0$ (or is undefined) AND changes sign

find the concavity and inflection points for the function
$y = 6x^5 - 10x^3$

① find the second derivative

$y' = 30x^4 - 30x^2$

$y'' = 120x^3 - 60x$

② set $y''=0$ (or undefined) + solve

$0 = 120x^3 - 60x$

$0 = 2x(60x^2 - 30)$

$0 = 2x$ $\quad$ $0 = 60x^2 - 30$

$0 = x$ $\quad$ $\frac{30}{60} = \frac{60x^2}{60}$

$\sqrt{\frac{1}{2}} = \sqrt{x^2}$

possible inflection points

$\sqrt{.5} = x$

$-\sqrt{.5} = x$

inflection pts at
$x = -\sqrt{1/2}, 0, \sqrt{1/2}$
concave down on
$x < -\sqrt{1/2}$, $0 < x < \sqrt{1/2}$
concave up on
$-\sqrt{1/2} < x < 0$, $x > \sqrt{1/2}$

③ make a table

$y'' = 2x(60x^2 - 30)$

(p.i.p) possible inf. pts	$-\sqrt{1/2}$		0		$\sqrt{1/2}$	
sign y''	−		+		−	+
behav. y	c.d.		c.u.		c.d.	c.u.

$y'' = 2x(60x^2 - 30)$
$= 60x(2x^2 - 1)$

$-\sqrt{\frac{1}{2}}$