Day 26 is Thursday, October 25, 2012

Resume Example from Tuesday

$$f(x) = 20 - 4x - \frac{250}{x^2}$$

Find absolute extrema on the interval $(0, \infty)$

Solution

Start by finding the critical values.

Start by rewriting $f(x) = 20 - 4x - 250x^{-2}$

$$f'(x) = \frac{d}{dx}\left(20 - 4x - 250x^{-2}\right)$$

$$= 0 \quad - 4 \quad - 250(-2)x^{-3}$$

$$= -4 \quad + 500\frac{1}{x^3}$$

rewrite without negative exponent.

$$f'(x) = -4 + \frac{500}{x^3}$$

Look for ~~critical values~~ partition numbers for f'.

x-values that cause $f'(x)$ to not exist:

$x=0$ causes $f'(x)$ DNE because cannot divide by zero. So $x=0$ is a partition number for f'.

x-values that cause $f'(x)=0$

$$0 = f'(x)$$

$$0 = -4 + \frac{500}{x^3}.$$

add 4 to each side

$$4 = \frac{500}{x^3}.$$

multiply both sides by x^3

$$4x^3 = 500$$

divide by 4

$$x^3 = 125$$

$$x = 5$$

So $x=0$ and $x=5$ are the partition numbers for f'.

But are they critical values for f?

Answer by seeing if $f(x)$ exists.

$$f(0) = 20 - 4(0) - \frac{250}{(0^2)} \quad \text{DNE}$$

So $x=0$ is not a critical value for f.

$$f(5) = 20 - 4(5) - \frac{250}{5^2} = 20 - 20 - \frac{250}{25} = -10$$

Since $f'(5) = 0$ and $f(5)$ exists, we conclude that $x=5$ is a critical value.

Next idea: Study the sign behavior of $f'(x)$ to determine more about the critical value $x=5$.

Sign chart for $f'(x)$