HW Due Mon 10/24:
handout packets:

- graphs
- multiple choice AP calculus problems
- final exam practice problems
- sudoku, etc. worksheets

Review Session: 3:30pm Tues 10/28

Exam: 9:00am Wed 10/29

- All A's on all 4 tests (after bonus pts) --> exempt from final (unless you want to take it because HW and quizzes are keeping you from an A in the class)
- Lowest of 4 regular test grades will be dropped (if it helps you)
- Final Exam can replace 2nd lowest test grade (if it helps you)

3.

$$\lim_{x\to\infty} \frac{x-\cos x}{x} = \lim_{x\to\infty} \frac{x}{x} - \lim_{x\to\infty} \frac{\cos x}{x}$$

$$= \lim_{x\to\infty} 1 - \lim_{x\to\infty} \frac{\cos x}{x}$$

$$= 1 - 0 = \boxed{1}$$

4.

$$\lim_{x\to-\infty}\frac{3x}{\sqrt{x^2+5}}=\lim_{x\to-\infty}\frac{3x}{\sqrt{x^2}}$$

$$=\lim_{x\to-\infty}\frac{3x}{|x|}=\lim_{x\to-\infty}\frac{3x}{-x}$$

$$=\lim_{x\to-\infty}(-3)=\boxed{-3}$$

7.

$$\lim_{x\to1}\frac{\ln(x^2)}{x^2-1}=\lim_{x\to1}\frac{\frac{1}{x^2}\cdot 2x}{2x}=\lim_{x\to1}\frac{1}{x^2}=\boxed{1}$$

8. $\lim_{x\to0}(e^x+x)^{2/x}=y$

$$\ln\left[\lim_{x\to0}(e^x+x)^{2/x}\right]=\ln y$$

$$\lim_{x\to0}\left[\ln(e^x+x)^{2/x}\right]=\ln y$$

$$\lim_{x\to0}\left[\frac{2}{x}\ln(e^x+x)\right]=\ln y$$

$$\lim_{x\to0}\left[\frac{2\ln(e^x+x)}{x}\right]=\ln y$$

$$\lim_{x\to0}\frac{2}{e^x+x}\cdot(e^x+1)=\ln y$$

$$\lim_{x\to0}\frac{2e^x+2}{e^x+x}=\ln y$$

$$\frac{4}{1}=\ln y\Rightarrow\boxed{y=e^4}$$

$300 = 2xh + 2(2x)x + 2(2x)h$

$300 = 2xh + 4x^2 + 4xh$

$300 = 6xh + 4x^2$

$150 = 3xh + 2x^2$

$\frac{150-2x^2}{3x} = h$

$\frac{150-2(5)^2}{3(5)} = h$

$\frac{100}{15} = \boxed{\frac{20}{3}\text{ cm}}$

$V = 2x \cdot x \cdot h$

$V(x) = 2x^2\left(\frac{150-2x^2}{3x}\right)$

$= \frac{300x^2 - 4x^4}{3x}$

$V(x) = 100x - \frac{4}{3}x^3$

$V'(x) = 100 - 4x^2$

$0 = 100 - 4x^2$ $x^2 = 25$ $x = 5$

$xy = 147$

$y = \frac{147}{x}$

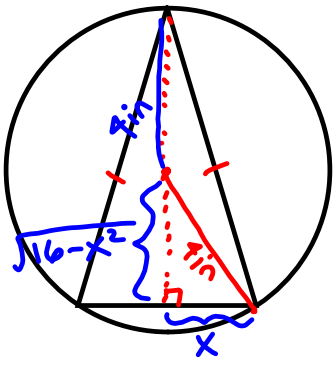
$S(x) = x + 3y$

$S(x) = x + 3\left(\frac{147}{x}\right)$

$S'(x) = 1 + 3(147) \cdot \frac{-1}{x^2}$

$x = 21$

$y = 7$



$$A(x) = x\left(4 + \sqrt{16-x^2}\right)$$

$A(2\sqrt{3}) = 12\sqrt{3}\ in^2$

$$A'(x) = 4 + \sqrt{16-x^2} + x \cdot \frac{1}{2\sqrt{16-x^2}} \cdot (-2x)$$

$$4 + \sqrt{16-x^2} - \frac{x^2}{\sqrt{16-x^2}} = 0$$

$$\sqrt{16-x^2} = \frac{2x^2-16}{4}$$

$$4 + \sqrt{16-x^2} = \frac{x^2}{\sqrt{16-x^2}}$$

$$\sqrt{16-x^2} = \frac{x^2}{2} - 4$$

$$4\sqrt{16-x^2} + 16 - x^2 = x^2$$

$$16 - x^2 = \frac{x^4}{4} - 4x^2 + 16$$

$$-4x^2 = x^4 - 16x^2$$

$$0 = x^4 - 12x^2 \qquad 0 = x^2(x^2-12)$$

$$x^2 = 12$$

$$x = \sqrt{12} = 2\sqrt{3} \Rightarrow \text{isosceles}$$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{\Delta x\to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$f'(c) = \lim_{x\to c} \frac{f(x) - f(c)}{x - c}$$

Optimization problems:

1. If I have 200 meters of fence to make a rectangular yard attached to the side of my barn, what dimensions will yield the max. area?

2. The sum of two numbers is -753. What are the two numbers if their product is a maximum?

★ replace #16 on Final Exam practice problems w/ these