April 18

Find all horizontal asymptotes for the function:

$$f(x) = \frac{\sqrt{4x^2 + 5}}{x - 10}$$

$\lim_{x\to\infty} \frac{\sqrt{4x^2+5}}{x-10}$

$= \lim_{x\to\infty} \frac{\sqrt{4x^2}}{x} = \lim_{x\to\infty} \frac{2x}{x} = 2$

$\lim_{x\to-\infty} \frac{\sqrt{4x^2+5}}{x+10}$

$= \lim_{x\to-\infty} \frac{|2x|}{x} = -2$

April 18

Students will verbally explain how to

Solve problems using calculus

(using the words:
derivative, integral, solve, etc...)

Test #2:
Multiple Choice
#2, 4, 9, 26, 89, 92
Free Response
#2

Sets 11-14

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I. Polar Equations

What you are finding: Polar equations are in the form $r = f(\theta)$. This generates a set of points that are at a radius r from the pole (origin) based on a function of θ, the central angle at the pole.

How to find it: We normally need to find slopes of these curves, which means that we need to represent the polar curve parametrically. The formulas to do so are: $x = r\cos\theta$ and $y = r\sin\theta$.

To find $\frac{dy}{dx}$, you use the formula: $\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta}$. Horizontal tangents occur when $\frac{dy}{d\theta} = 0$ and vertical tangents occur when $\frac{dx}{d\theta} = 0$. If $\frac{dy}{d\theta}$ and $\frac{dx}{d\theta}$ are both zero simultaneously, no conclusion can be made.

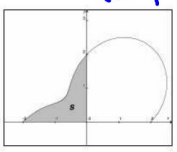
Typical AP problems involve finding the area bounded by a polar curve between two angles α and β.

$A = \frac{1}{2}\int_{\alpha}^{\beta}[f(\theta)]^2 d\theta$. This assumes the function f is continuous and non-negative.

~~Arc length in polar form is given by the formula: $s = \int_{\alpha}^{\beta}\sqrt{[f(\theta)]^2 + [f'(\theta)]^2}\,d\theta = \int_{\alpha}^{\beta}\sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\,d\theta$~~

not on AP (skip 35d)

Example 32: A curve shown in the figure to the right is described by the polar equation $r = 2 + \sin(2\theta)$ where θ is measured in radians. Let S be the shaded region in the 2nd quadrant.



a) Write an integral expression for the area of region S.

b) Write expressions for $\frac{dx}{d\theta}$ and $\frac{dy}{d\theta}$.

c) Show that the equations in terms of x and y for the lines tangent to the graph of the polar curve at the point where $\theta = \pi/2$ and $\theta = \pi$ are the same.