Math 131, Spring 2004
Quiz #3, Discussion Section A (Thursday, 11:00-12:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: ______________________ ID# ______________________

1. Find the equation of the tangent line to the curve $y = 2x + 1$ at the point $(2, 5)$.

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} \quad ; \quad \text{Here } f(x) = 2x+1, \; a = 2, \; f(a) = 5$$

$$\text{So } m = \lim_{x \to 2} \frac{2x+1-5}{x-2} = \lim_{x \to 2} \frac{2(x-2)}{x-2} = 2$$

tan. line : $y - 5 = 2(x-2)$ or $y = 2x+1$

2. Evaluate $\lim_{x \to \infty} \cos\left(\frac{\pi x^2 + 1}{x^2 - 20x - 5}\right)$.

$$\lim_{x \to \infty} \cos\left(\frac{\pi x^2 + 1}{x^2 - 20x - 5}\right) = \cos\left[\lim_{x \to \infty} \frac{\pi x^2 + 1}{x^2 - 20x - 5}\right]$$ since cos is continuous

$$= \cos\left[\lim_{x \to \infty} \frac{\pi + 1/x^2}{1 - 20/x - 5/x^2}\right]$$

$$= \cos \pi$$

$$= -1$$

Math 131, Spring 2004
Quiz #3, Discussion Section B (Tuesday, 12:00-1:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: Answer Key ID# 2/10

1. Suppose $f(x) = x^3 + 2x^2 - 1$. Use the Intermediate Value Theorem to show there exists a number c for which $f(c) = 12$. Please be sure to verify the hypotheses of the theorem.

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

f is continuous for all x in $\mathbb{R}$ b/c f is a poly.
In particular, f is continuous on $[0,2]$

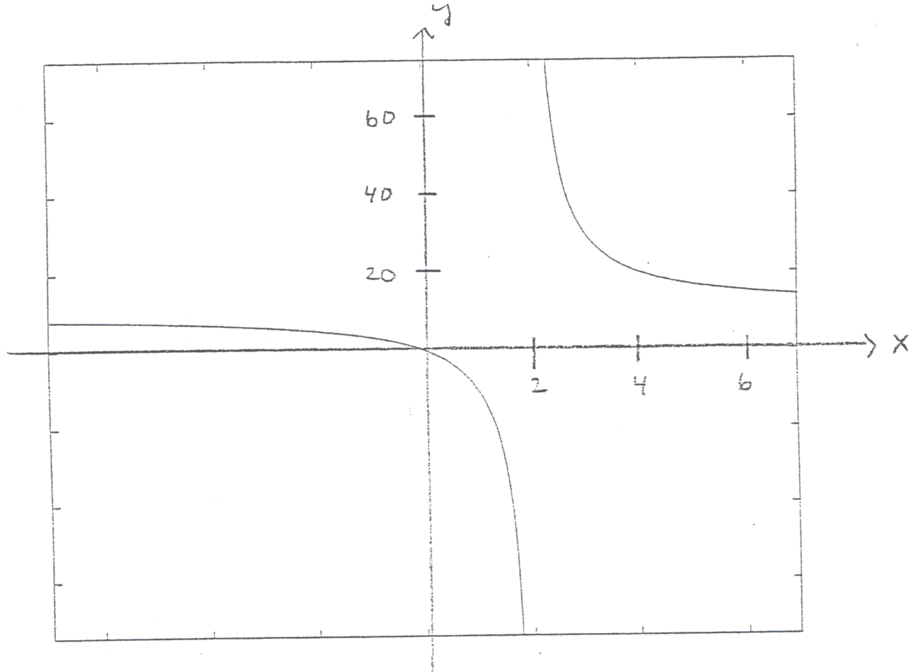
$f(0) = -1$, $f(2) = 15$

Now $-1 < 12 < 15$, so there exists c such that $0 < c < 2$ & $f(c) = 12$, by the Intermediate Value Theorem.

(OVER)

2. Which of the following equations matches the graph shown below. Please explain your reasoning. (Hint: Think about asymptotes.)

a) $f(x) = \dfrac{10}{x-2}$ b) $f(x) = \dfrac{10}{(x-2)^2}$ c) $f(x) = \dfrac{10x}{x-2}$ d) $f(x) = \dfrac{10x}{(x-2)^2}$



Not a: $f(x) = \dfrac{10}{X-2}$ is positive for $X > 2$ &

negative for $X < 2$

Not b: $f(x) = \dfrac{10}{(X-2)^2}$ is positive everywhere

Not d: $\lim\limits_{X \to \infty} \dfrac{10X}{(X-2)^2} = 0$

So equation c matches the graph.

Math 131, Spring 2004
Quiz #3, Discussion Section C (Thursday, 12:00-1:00)

Quiz problems should be solved using the methods discussed in this course. A calculator is not permitted. To receive full credit, show enough work to make it clear how you got your answer.

Name: ______________________ ID# ______________________

1. Find all vertical and horizontal asymptotes of the function $f(x) = \dfrac{1-2x}{x^2+5x-6}$.

$$f(x) = \frac{1-2x}{(x+6)(x-1)}$$

$$\lim_{x\to 1^+} f(x) = -\infty \Rightarrow \text{v.a. @ } x=1$$

$$\lim_{x\to -6^+} f(x) = -\infty \Rightarrow \text{v.a. @ } x=-6$$

$$\lim_{x\to\infty} \frac{1-2x}{x^2+5x-6} = \lim_{x\to-\infty} \frac{1-2x}{x^2+5x-6} = 0 \Rightarrow \text{h.a. @ } y=0$$

2. A football is punted in the air. Its height (in meters) after t seconds is given by $y = 10 + t^2$. Find the velocity when $t = 3$ seconds. What are the units?

$$V = \lim_{x\to 3} \frac{f(x)-f(3)}{x-3} = \lim_{x\to 3} \frac{10+x^2-19}{x-3}$$

$$= \lim_{x\to 3} \frac{(x+3)(x-3)}{x-3}$$

$$= 6$$

So the velocity when $t=3$ is 6 meters/second