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 \((2, 5)\).

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

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

Tangent 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

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

\[
= \cos \pi
\]

\[
= -1
\]
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.
2. Which of the following equations matches the graph shown below. Please explain your reasoning. (Hint: Think about asymptotes.)

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

Not a: \( f(x) = \frac{10}{x - 2} \) is positive for \( x > 2 \) & negative for \( x < 2 \)

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

Not d: \( \lim_{x \to \infty} \frac{10x}{(x - 2)^2} = 0 \)

So equation c matches the graph.
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Name: ___________________________    ID# ___________________________

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

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

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

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

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

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.