

NAME _____ ID _____

MATHEMATICS 249

MIDTERM

November 8, 2005

SHOW ALL WORK. Marks for each problem are to the left of the problem number.
NO CALCULATORS PLEASE.

[5] 1. Find $\lim_{x \rightarrow -2} \left(\frac{4x^2 + x - 14}{3x + 6} \right)$. (If it is possible to give the answer ∞ or $-\infty$, do so.)

[5] 2. Find $\lim_{x \rightarrow \infty} \left(\frac{x^2}{x - 5} - \frac{x^2}{x + 5} \right)$. (If it is possible to give the answer ∞ or $-\infty$, do so.)

[5] 3. Find $\lim_{x \rightarrow 1^-} \left(\frac{x - 11}{1 - x} \right)$. (If it is possible to give the answer ∞ or $-\infty$, do so.)

[5] 4. Find $\frac{d}{dx} \left(x^2 \sqrt{8 - 3 \cos^3 x} \right)$.

[5] 5. Find $\frac{d}{dx} \left(\frac{\tan(7x^4)}{x^2 - 6x + 3} \right)$.

[5] 6. USE THE DEFINITION OF DERIVATIVE to find $\frac{d}{dx} (\sqrt{3 - 4x})$.

[5] 7. Use implicit differentiation to find $\frac{dy}{dx}$ where $\sin(x - y) = \sqrt{x} - \sqrt{y}$.

[5] 8. Find the equation of the tangent line to the curve $y = \frac{4}{8 - 3x}$ at the point on the curve where $x = 2$.

[5] 9. Find constants a and b so that the function

$$f(x) = \begin{cases} ax^2 + b & \text{if } x \leq -1 \\ 2x - 5 & \text{if } x > -1 \end{cases}$$

is both continuous and differentiable at $x = -1$.