**NAME:**__________________________________ **Section:**________

MATH 151 (Fall 2008) Dr. Z. , **Second Practice Exam for First Midterm**.

1. (12 points) Find $f'(x)$, if

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

from the definition of the derivative [No Credit for other methods].

2. (12 points) Find the equation of the tangent line to the curve

$$x^5 + 2x^2y^3 + y^5 = 0 \quad ,$$

at the point $(1, -1)$.

3. (12 points [4 points each]) If the Law of Motion of a particle is $s(t) = t^4 + 4t$, find

(a) The speed and direction (forward or backwards) at $t = 1$.

(b) The time(s) when it is at rest.

(c) The total distance travelled between $t = 1$ and $t = 2$.

4. (16 points ([4 pts each]) Find the derivative $f'(x)$ if:

(a) $f(x) = \frac{x^3+2}{3x^2-5}$

(b) $f(x) = x^2 \cos x + 3x^2 + e^x$

(c) $f(x) = \frac{2+3e^x}{5+e^x}$

(d) $f(x) = x^2 e^{x^3}$

5. Using the information

$$f(3) = 4 \quad , \quad g(3) = -1 \quad , \quad h(3) = 2$$

$$f'(3) = 2 \quad , \quad g'(3) = 5 \quad , \quad h'(3) = -2 \quad , \quad f'(-1) = 10$$

Compute [3 points each]

(a) $(fg)'(3)$

(b) $\left(\frac{f}{g}\right)'(3)$

(c) $(f(g(x)))'\Big|_{x=3}$

(d) $(f(x) + g(x) + 2h(x))'\Big|_{x=3}$.

6. (12 points [3 pts each]) Find the limits

$$(a) \quad \lim_{x\to 2} \frac{x^2-4}{x^2-9x+14}$$

$$(b) \lim_{x\to -3} \frac{3+x}{\sqrt{12+x}-3}$$

$$(c) \quad \lim_{x\to \pi/6} \frac{1+\cos^2 x}{x^2}$$

$$(d) \quad \lim_{x\to 0} x\sin(\frac{3}{x})$$

(Explain!)

7. (12 points) Let

$$f(x) = \begin{cases} x^7 + 13, & \text{if } x < 0; \\ 13 + 2x + x^2, & \text{if } 0 \le x < 1; \\ x^5, & \text{if } x \ge 1\ . \end{cases}$$

(a) [1 pt. each] For each of the following limits, evaluate it, if it exists.

(i) $\lim_{x \to 0^+} f(x)$

(ii) $\lim_{x \to 0^-} f(x)$

(iii) $\lim_{x \to 0} f(x)$

(iv) $\lim_{x \to 1^+} f(x)$

(v) $\lim_{x \to 1^-} f(x)$

(vi) $\lim_{x \to 1} f(x)$.

(b) [6 pts] Where is $f$ discontinuous? Explain! (no credit without explanation).

8. Find the inverse function, $f^{-1}(x)$ if

(a) [4 points] $y = x^3 + 1$

(b) [4 points] $y = \frac{1}{x+5}$

(c) [4 points] $y = \sqrt{x+6}$.