MATH 113 – 1 JUNE 2007 – EXAM 2

Answer each of the following questions. Show all work, as partial credit may be given.

1. (10 pts.) Let $f(x) = x^2 + x$. Find the derivative of $f(x)$ by directly computing the limit of the difference quotient.

2. (5 pts. each) Find the first derivative of each of the following functions. You may use any method you like.

(a) $f(x) = x^2 + x - 8x^{-1}$

(b) $y = \left(x + \dfrac{1}{x}\right)(x + 1)$

(c) $f(t) = \dfrac{2t + 1}{1 - t^2}$

(d) $y = x^2\, e^{-2x}$

(e) $f(x) = \dfrac{\cos(x)}{x}$

(f) $r = \tan^3(\theta)$

3. (10 pts. each) Find the first and second derivatives of the following functions. You may use any method you like.

(a) $f(x) = \dfrac{2x^2 + 5}{x}$

(b) $y = \sin(x^2)$

4. (10 pts. each) The position s (in meters) of a body at time t (in seconds) is given by $s = t^3 - 12t^2 + 36t$, $0 \leq t \leq 8$.

(a) Find expressions giving the velocity v and acceleration a of the body at time t.

(b) Find the times t at which the body is at rest.

(c) Find the intervals of t for which the body is moving to the right and to the left.

5. (10 pts.) Find an equation for the tangent line to the curve defined implicitly by the equation $y^3 - 3xy = x^3 - y$ at the point $(-2, -1)$.