Math 284, Final Exam (Spring 2007)

Student Name:

Student Number:

Lecture Class Instructor Name (check one): Datta, Gogus, Xu

Recitation Class Instructor Name:

Problem 1:

Problem 2:

Problem 3:

Problem 4:

Problem 5:

Problem 6:

Problem 7:

Problem 8:

Problem 9:

Problem 10:

Total:
1. (a) (5 points) Find an equation of the line passing through the point $(-2, 6)$ and perpendicular to the line $3y + 8x = 4$.

(b) (5 points) Rewrite the equation you found in part (a) as a general linear equation.

(c) (5 points) Find the $x$-intercept and $y$-intercept of the equation you found in part (a).

$x$-intercept = 

$y$-intercept = 

2. (10 points) Find the equilibrium point if the supply and demand equations are

\[ p = 2q + 10 \quad \text{and} \quad p = 20 - q, \]

respectively.
3. (a) (5 points) Find $x$, if $\log_x(6 + 4x - x^2) = 2$. 

(b) (5 points) Find $x$, if $g^{2x+1} = 3$. 

4. Find the limits:
(a) (5 points) $\lim_{t \to 2} \frac{t-2}{t^2-5t+6}$
(b) (5 points) \( \lim_{x \to \infty} \frac{5x^2 - 2x^2 + 7}{4x - x^3} \)

(c) (5 points) \( \lim_{x \to 3} \frac{2x}{x - 3} \)

5. (12 points) Use the definition of the derivative to find \( f'(x) \) if \( f(x) = x^2 + x \).
6. (11 points) Find an equation of the tangent line to the curve \( y = x^4 - 2x^3 + 3x - 4 \) when \( x = 1 \).

7. Find the derivative \( y' \) of the following functions:
   
   (a) (5 points) \( y = 2^{2x} \)

   (b) (5 points) \( y = \log_2(x^2 + 1) \)

   (c) (5 points) \( y = \left(\frac{x^3 - 1}{x^2 - 2}\right)^5 \)
8. Let \( f(x) = x^4 - 2x^2 + 4 \) be the given function.
(a) (5 points) Find the intervals where the function \( f \) is decreasing or increasing.

(b) (5 points) Find the intervals where the function \( f \) is concave up or concave down.

(c) (5 points) Find relative maxima and minima of \( f \).

9. Find the indefinite integrals for the following functions:
(a) (5 points) \( \int x^4 \, dx \)
10. (12 points) If the marginal-revenue function for a manufacturer’s product is

\[ \frac{dr}{dq} = 2001 - 10q - 3q^2 \]

find the demand function.