Intro to Calculus
Final Exam Day 2

Name:_____
Teacher: Haupt / King / Swartz

Directions: For full credit, show all work in the space provided in this package. Any scrap paper used should be attached. Neatness is expected and appreciated.

Part 1: Multiple Choice

For problems 1-5, differentiate each of the following functions.

1. $f(x) = 4^x$

a. $f'(x) = \frac{1}{4^x}\ln 4$ b. $f'(x) = 4^x \ln 4$ c. $f'(x) = 4^x \ln 3$ d. $f'(x) = -\frac{1}{4^x}\ln 3$

2. $g(s) = \sin(\ln(3s^2))$

a. $g(s) = \frac{2}{s}\cos(\ln(3s^2))$ b. $g(s) = \frac{\cos(\ln(3s^2))}{3s^2}$ c. $g'(s) = -\frac{2}{s}\cos(\ln(3s^2))$ d. $g'(s) = \frac{\cos(\ln(3s^2))}{\ln(3s^2)}$

3. $r(a) = a\sqrt{a^2+1}$

a. $r'(a) = \frac{a}{\sqrt{a^2+1}}$ b. $r'(a) = -\frac{1}{\sqrt{a^2+1}}$ c. $r'(a) = \frac{a^2 + \frac{1}{2}a + 1}{\sqrt{a^2+1}}$ d. $r'(a) = \frac{2a^2+1}{\left(a^2+1\right)^{1/2}}$

4. $f(t)=\dfrac{t}{(1-t)^3}$

a. $f'(t)=\dfrac{-1}{3(1-t)^2}$ b. $f'(t)=\dfrac{1-2t}{(1-t)^4}$ c. $f'(t)=\dfrac{1-4t}{(1-t)^4}$ d. $f'(t)=\dfrac{1+2t}{(1-t)^4}$

5. $y^2+x^2-2y-4x=4$

a. $\dfrac{dy}{dx}=\dfrac{3-x}{y}$ b. $\dfrac{dy}{dx}=\dfrac{4-x}{y-1}$ c. $\dfrac{dy}{dx}=\dfrac{2-x}{y-1}$ d. $\dfrac{dy}{dx}=\dfrac{1-x}{y}$

For problem 6, solve.

6. Suppose that the profit realized by a department store *t* days after its opening is given by the formula $4t^3-2t+1$. What was the average profit per day of the store during the first five days?

a. \$121 b. \$218 c. \$225 d. \$97.80

Part 2: Open Response

7. Find the equation of a line tangent to the function $y = x^3 e^{2x^3}$ at x=1. (Leave answer in terms of e.)

8. Find the area between the curves $y = x^3 - 3x + 1$ and $y = x + 1$

9. The demand equation for a particular company is $p = 150 - 0.02x$ and the cost function is $C(x) = 10x + 300$. Given that $P(x) = R(x) - C(x)$ and that $R(x) = x \cdot p$, find the following:

a. The value of x which maximizes the profit.

b. The price of the product which maximizes the profit.

c. The maximum profit.