

Business Calculus I (Math 221) Exam 3

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Justify answers and show all work for full credit.

NAME: _____

Problem 1. Suppose x and y satisfy $4\sqrt{x} + xy^3 - 2 = x^2 - 6y$.
Find $\frac{dy}{dx}$ at the point $(4, 1)$.

Problem 2. Find the derivatives $\frac{dy}{dx}$.

(a) $y = \ln(7x^3 - 9x - 3)$

(b) $y = e^{(-4x+3)} + \frac{9}{x} - 3$

(c) $e^{6y} + \ln(y) = \frac{5}{\sqrt{x}} + x$

Problem 3. Evaluate

(a) $\int 3x^4 + \frac{2}{x^6} + \frac{4}{x} - 10 \, dx$

(b) $\int 4x^{3/5} - 3e^{7x} - \sqrt[3]{x} + \frac{13}{x^4} \, dx$

(c) $\int x^4 \sqrt{2x^5 + 3} \, dx$

(d) $\int \frac{3x^8}{x^9 - 2} \, dx$

Problem 4. Some kids rolling a snowball to make a snowman can add $80 \text{ cm}^3/\text{min}$ of snow to the ball. How fast is the radius of the snowball increasing when the radius is 10 cm ? (For a sphere, $V = \frac{4}{3}\pi r^3$.)

Problem 5. The wind blows a kite 80 ft above the ground at $10 \text{ ft}/\text{sec}$ parallel to the ground. How fast must the string be let out when the string is 100 ft long?

Problem 6. Suppose a bond that now costs \$2,000 will return \$5,000 in 30 years.

- (a) If compounded continuously, what is the interest per year (APR) on the bond?
- (b) How much will the bond be worth after 10 years?

Problem 7. To produce x flerds, the marginal cost in dollars is $\overline{MC} = 4x + 30$, and the marginal revenue is $\overline{MR} = 110$. The fixed cost for making flerds is \$1,000.

- (a) Find the marginal profit function $\overline{MP}(x)$, where x is the number of flerds.
- (b) Find the profit function $P(x)$ for flerds.
- (c) After how many flerds, if ever, will selling flerds be profitable? Explain.