# EXAM #2 Review

MATH 142, Drost

Name: _____
Section # _____
Seat # _____

1. Katy's Kitchen has a total cost function of $C(x) = \sqrt{x+25}$ to make $x$ jars of jam, and $C(x)$ is measured in dollars. The revenue in dollars, is $R(x) = \ln(x^3 - 64)$.

   a. Write the profit function.

   b. Using marginal profit, estimate the profit on making the $12^{th}$ jar of jam.

2. Find the **marginal average cost** for R&R Railways, to take 50 passengers on a 1 hour trip, when they have a cost function of $C(x) = 200x \cdot e^{0.01x}$, where $x$ represents the number of passengers each day, and $C(x)$ is measured in dollars.

3. If \$4500 is invested at $5\frac{3}{4}\%$ for 15 months, what will the balance be if the account is:

   a. compounded continuously? _____

   b. compounded monthly? _____

4. Find the derivative of $f(x) = e^{2x} \cdot (x^2 + 5x)$

5. Find the derivative of $g(x) = \ln\left(\dfrac{x^3 \cdot \sqrt{x^4 - 1}}{3x + 10}\right)$

6. Find the derivative of $y = 5^{x^2+2x}$

7. Find $f'(3)$ given $f(x) = \dfrac{g(x)}{e^{2x}}$, $g(3) = 5$, and $g'(3) = -2$.

8. Find the equation of the tangent to the curve $f(x) = g(x) \cdot h(x)$ at $x = 4$ given that:

   $g(4) = -2$, $h(4) = 6$,

   $g'(4) = 5$, and $h'(4) = 3$

9. The Athletic department calls you in as a consultant asking for advise on ticket prices for the baseball games. The price, $\$p$, and the quantity, $x$, of tickets sold, are related by the equation $f(p) = x = 22e^{-0.05p}$.

   a. Find the elasticity of demand function.

   b. At a price of \$15 per ticket, is the function elastic or inelastic, **AND** should the price be increased or lowered to maximize the revenue? Explain your answer as related to the elasticity of demand.

10. Find the critical values for $f(x) = 4 \ln x - 8x$.

11. Given $f''(x) = x^2(x-3)(x+4)$, find the interval(s) where $f'(x)$ is decreasing.

12. $f(x)$ has a domain of $(0, \infty)$, where $f'(x) = \dfrac{1}{x} - \dfrac{2}{x^2}$. State the interval(s) over which $f(x)$ is concave up and concave down, if they exist.

13. Find the third derivative of $f(x) = e^{3x} - \ln x^3 + x^2$.

14. $y = \ln(3u^2 + 1)$ and $u = x^3 + e^2$. Find $\dfrac{dy}{dx}$

15. Find the $x-$values of the relative extrema for $y = 2x^3 + 3x^2 - 36x + 10$.

16. Find the equation of the line tangent to the curve $y = e^{2x}$ at $x = 1$

17. Given $f(x) = 5(6 - 2x)^3$, find $f'(2)$.

18. Evaluate $\lim_{x\to\infty} \dfrac{2x^2 - 3x + 5}{4x^2 + x + 1}$

19. Find the oblique asymptote for $f(x) = \dfrac{x^3 + 2x^2 + x - 1}{x^2 - 2x + 3}$

20. Given $f(x) = \log_4(x^2 + 2)$, find the derivative.

21. Find the derivative of $f(x) = \sqrt{x^3 + x} \cdot \log_2(x^2 + e^3)$, and do not simplify.

22. Find any points of inflection for the function $f(x) = -x^4 - 4x^3 + 48x^2 + 8x + 15$.

23. The price-demand function $p = \sqrt[3]{32 - x}$ models the price of Gary's Gadgets.

    a. Find the elasticity of demand when the price is \$1.50.

    b. Should the price remain the same, or be raised or lowered in order to increase revenue?

    c. What price maximizes revenue?

    d. If the price is raised 5%, what is the resulting change in demand?

24. Find the absolute extrema of $g(x) = 4\ln(x) - 2x$.

25. Describe the graph of $f(x)$ at $x = -1$, if $f'(-1) = 0$ and $f''(-1) < 0$.

    a. Local maximum  b. Local minimum  c. neither

    d. unable to determine from the given information  e. I don't know

26. Find the absolute extrema, if they exist, for the function $f(x) = x^4 - 10x^2 + 25$ on the interval $[-2, 1]$.

27. The total cost of producing $x$ plaques for the Presidential Library is $C(x) = 1350 + 5x$. The price-demand function for the plaques is $p = 120 - 0.05x$. What should they charge to maximize profit on the plaques?

28. *Inventory control*: A pharmacy has a uniform annual demand for 200 bottles of a certain antibiotic. It costs \$10 to store one bottle for one year and \$40 to place an order. How many times during the year should the pharmacy order the antibiotic in order to minimize the total storage and reorder costs?
Source: *p.353, problem #28, CALCULUS for Business, Economics, Life Sciences, and Social Sciences, by Barnett, Ziegler, Byleen*

29. For the function $f(x) = \dfrac{2x^2 + 10}{4 - x^2}$, find each of the following:

    a. domain

    b. intercepts

    c. any asymptote(s)

    d. any critical point(s)

    e. intervals where $f(x)$ is increasing

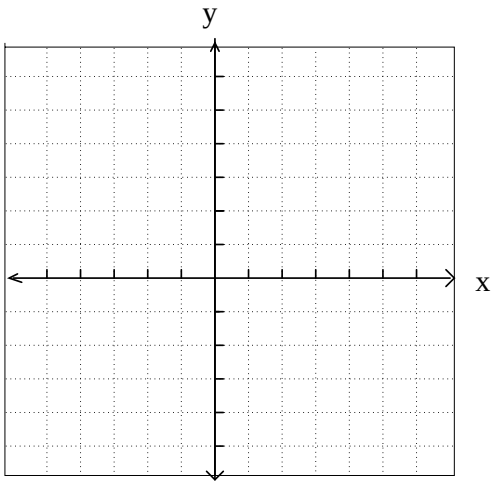
    f. intervals where $f(x)$ is decreasing

    g. intervals where $f(x)$ is concave up

    h. intervals where $f(x)$ is concave down

    i. sketch a graph

    j. partition points




30. For the function $f(x) = \dfrac{x^3}{x^2 - 2x + 1}$, find each of the following:

    a. domain

    b. intercepts

    c. any asymptote(s)

    d. any critical point(s)

    e. intervals where $f(x)$ is increasing

    f. intervals where $f(x)$ is decreasing

    g. intervals where $f(x)$ is concave up

    h. intervals where $f(x)$ is concave down

    i. sketch a graph

    j. partition points