Test 2 **MTH102 Review Questions**

1. Find the indicated derivative and simplify:

   (a) $f(x) = (4x + 3e^{x})^{4}$

   (b) $f(x) = \dfrac{e^{x}}{2x^{2}}$

   (c) $f(x) = (x^{2} + 1)e^{-x}$

   (d) $h(t) = e^{(3t^{4} + 6)}$

   (e) $G(x) = \ln(x^{3} - 1)^{-3}$

   (f) $f(x) = [\ln(x^{3} - 1)]^{-3}$

   (g) $f(x) = (e^{x} + 3)^{4} \ln x$

   (h) $y = \log_{3}(4x^{3} + 5x + 7)$

   (i) $M(x) = 8^{(4x + \ln x)}$

   (j) $k(x) = \log(x^{3} - 1)$

2. Find all horizontal and vertical asymptotes:

   a) $f(x) = \dfrac{x - 1}{x^{3} + 3}$ b) $f(x) = \dfrac{x^{3}}{x^{2} + 4x + 4}$ c) $f(x) = \dfrac{x^{2} - 4}{x^{2} + 4}$

3. Summarize the pertinent information obtained by applying the graphing strategy and sketch the graph of f(x).

   (a) $f(x) = \dfrac{2x - 4}{x + 2}$

   (b) $f(x) = (3 - x)e^{x}$

   (c) $f(x) = \ln(x + 1)$

   (d) $f(x) = \dfrac{2x}{x^{2} - 9}$

   (e) $f(x) = e^{-0.5x^{2}}$

4. Find the absolute maximum and minimum, if either exists, for each function.

   a) $f(x) = x^{2} - 2x + 3$

   b) $f(x) = x + \dfrac{4}{x}$ $, (0, \infty)$

   c) $f(x) = -x^{2} - 6x + 9$

   d) $f(x) = (x - 1)(x - 5)^{5} + 1$ on [3,6]

5. Let $p = 400 - 0.4x$ and $C(x) = 160x + 2{,}000$ be the price –demand equation and the cost function respectively, for the manufacturing and selling of x digital cameras per week.

   (A) What price should the company charge for the cameras and how many cameras should be produced to maximize the weekly revenue? What is the maximum revenue?

   (B) What is the maximum weekly profit? How much should the company charge for the cameras and how many cameras should be produced to realize the maximum weekly profit?

   (C) If the government decides to tax the company $4 for each camera it produces, how many cameras should the company manufacture each week to maximize its profit? What is the maximum profit? What should the company charge for each camera?

6. Find the equation(s) of the tangent line(s) to the graphs of the indicated equations at the given point(s)

   a) $y^2 - xy - 6 = 0$; x=1

   b) $x^2 - y = 4e^y$; (2,0)

   c) $(2x - y)^4 - y^3 = 8$; (-1,-2)

   d) $\ln(xy) = y^2 - 1$; (1,1)

7. For a company manufacturing calculators, the cost, revenue and profit equations are given by:

$C = 90{,}000 + 30x$ $R = 300x - \frac{x^3}{30}$ P=R-C

If the production x is increasing at a rate of 500 calculators per week when production output is 6,000 calculators, find the rate of increase (decrease) in cost, revenue and profit?

8. Find each indefinite integral:

(a) $\int (3x^2 - \frac{2}{x^2})dx$

(b) $\int \frac{e^x - 3x^2}{2} dx$

(c) $\int (\sqrt[3]{x^2} - \frac{4}{x^3})dx$

(d) $\int x^2 e^{x^3} dx$

(e) $\int \frac{1}{x(\ln(x))^2} dx$

(f) $\int x^3 \sqrt[4]{x^4 + 8}\ dx$

9. Find the particular antiderivative of each derivative that satisfies the given condition:

(a) $C'(x) = 6x^2 - 4x$; $C(0) = 3000$

(b) $\frac{dx}{dt} = 4e^t - 2$; $x(0) = 1$

10. Given the equation of the marginal cost function:

$$C'(x) = 3x^2 - 24x + 53$$

Find the cost function if monthly fixed costs at 0 output are 30,000. What is the cost of producing 4000 units.