OPPORTUNITY TO EXCEL # 2
MATH 142
Business Calculus - Spring 2002
Dr. Patrice Poage
VERSION A

SIGNATURE: _____
(name)

SS #:

SECTION #:

ROW # YOU *NORMALLY* SIT IN:

ROW/SEAT # YOU ARE IN RIGHT NOW:

- Check to see that you have 4 pages including the cover page.
- All 13 problems are to be done on the test paper. You *must show work* to receive full credit on a problem. Include any intermediate steps and programs/functions you use on your calculator. If you do the work in your head, you must turn in your head to receive partial credit.
- BOX all your answers!
- *SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED.*

BOX ALL OF YOUR FINAL ANSWERS!!

1. (5 pts) Using $E = -\frac{p}{x} \cdot \frac{dx}{dp}$, find the elasticity of demand for $x = \frac{10}{\sqrt{p}}$ at $p = 2$.

2. (2 pts) Which of the following describes your answer for #2 (circle your choice):

   elastic inelastic unit elasticity

3. (4 pts each) Find the following limits:

   (a) $\lim_{x\to\infty} \frac{e^x - 3}{2e^{-x} + 4}$

   (b) $\lim_{x\to-\infty} \frac{7x^2 + 5x^4 + 2x}{8x^3 + 4x - 8}$

   (c) $\lim_{x\to 16} \frac{-x + 16}{\sqrt{x} - 4}$

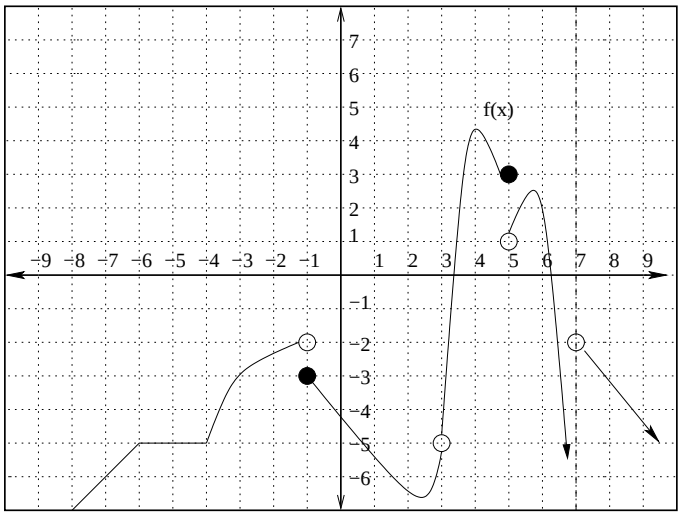
   (d) $\lim_{x\to-\infty} \frac{2^x - 8}{5 + 9^x}$

4. (6 pts) Suppose the demand of a commodity is given by $p(x) = e^{-2x}$. Find the x-value(s) where the marginal revenue is zero.

5. (6 pts) Given $f'(x) = \dfrac{(x-2)^2(x+5)}{125}$, $f(2) = 1$, $f(-2) = 4$, $f(5) = \dfrac{3}{7}$ and $f(-5) = \dfrac{1}{5}$, determine all relative extremum for $f(x)$ (give answer in point (x,y) form).

6. (4 pts) If $V = \dfrac{4\pi r^3}{5} + 4^{2r^4+1}$, find $\dfrac{dV}{dr}$ (do NOT simplify your answer).

7. Use the graph of $f(x)$, to the right, to answer the following questions:



   (a) (3 pts) Find $\lim\limits_{x \to 5^-} f(x)$

   (b) (3 pts) At what x-value(s) does $f'(x)$ not exist?

   (c) (3 pts) At what x-value(s) does the limit of $f(x)$ not exist?

   (d) (5 pts) Place the following derivatives in order from smallest to largest numerical value.
   $f'(-7)$, $f'(-2)$, $f'(0)$, $f'(4)$, $f'(6)$

   smallest: _____, _____, _____, _____, _____ largest

8. (6 pts) Find the *intervals* for which $f(x) = x^4 - 32x^2 + 20$ is concave up / concave down. Show all work. Round answers to 3 decimal places.

9. (6 pts) What three things should you ask yourself when determining whether or not a function, $f(x)$, is continuous at $x = a$?

   1.

   2.

   3.

10. (5 pts) Find the equation of the tangent line (round to 2 decimal places) to $y = \frac{3}{x} + \frac{1}{2 + x^2}$ at x=3. *HINT: To save time, find it on your calculator!*

11. (5 pts each) Find the derivatives of the following functions.
DO **NOT** SIMPLIFY AT ALL!

(a) $y = \sqrt[3]{(2x^4)(4x - \ln(5x))}$

(b) $f(x) = 2^{3x} - \ln(\ln(x^2 - 5x + \pi^3))$

(c) $g(x) = \dfrac{(6x)^5}{4x^2 + e^{5x^3 - x^9}}$

(d) $y = \sqrt{\sqrt{x} + 1} - 8\ln(5) + \dfrac{1}{x^4}$

12. (9 pts) Sketch a possible graph of $f(x)$ (on the axis provided) based upon the following characteristics. Erase all other markings except your final answer.

- $f(2) = 2$ and $f(4) = -2$
- x-intercepts at $-\frac{1}{2}$, $\frac{5}{2}$, and 5
- y-intercept at 2
- vertical asymptote at x=-1
- $f'(1) = 0$, $f'(4) = 0$
- $\lim_{x \to -\infty} f(x) = 0$
- $\lim_{x \to \infty} f(x) = \infty$
- $f'(x) < 0$ on $(1, 4)$
- $f'(x) > 0$ on $(-\infty, -1)$, $(-1, 1)$, and $(4, \infty)$
- $f''(x) < 0$ on $(-1, 1)$
- $f''(x) > 0$ on $(-\infty, -1)$ and $(1, \infty)$