Name:

Math 122 (Fall '15)
Midterm 1
October 1, 2015

1. (15pts)	
2. (15pts)	
3. (15pts)	
4. (15pts)	
5. (20pts)	
6. (20pts)	
Total (100pts)	

1. (15pts) Solve the following equations:

(1) $5x + 3 = 3x + 5$

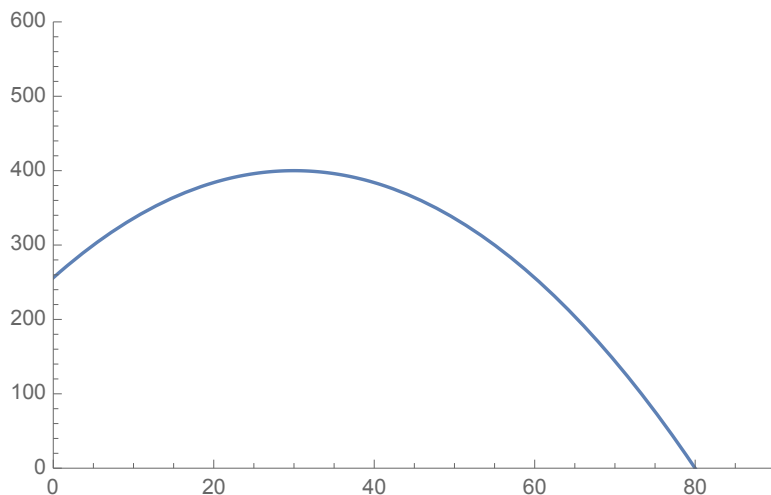(2) $x^3 = 4x$

(3) $\sqrt{x} = 2x^{\frac{1}{3}}$

(4) $2e^x = 2^x$

(5) $\ln(x) + \ln(2x) = \ln 3$

2. (15pts) The yield, Y, of an apple orchard (in bushels) as a function of the amount, a, of fertilizer (in pounds) used on the orchard is shown below.

(a) Describe the effect of the amount of fertilizer on the yield of the orchard.

(b) What is the vertical intercept? Explain what it means in terms of apples and fertilizer.

(c) What is the horizontal intercept? Explain what it means in terms of apples and fertilizer.

(d) Is the function increasing or decreasing at $a = 60$?

(e) Is the graph concave up or down near $a = 40$?

3. (15pts) Assume that $12,000 are deposited into an account. How long does it take to reach $20,000 if either

A) the account is paying no interest, but the owner deposits $1,000 each year.

or

B) the account is paying 8% interest compounded continuously (and no further deposits).

Note: *In each of the two cases, write down the function modeling the situation, and solve the corresponding equation.*

4. (15pts) The following table give $P = f(t)$, the number of households, in millions, in the US with cable television t years since 1998
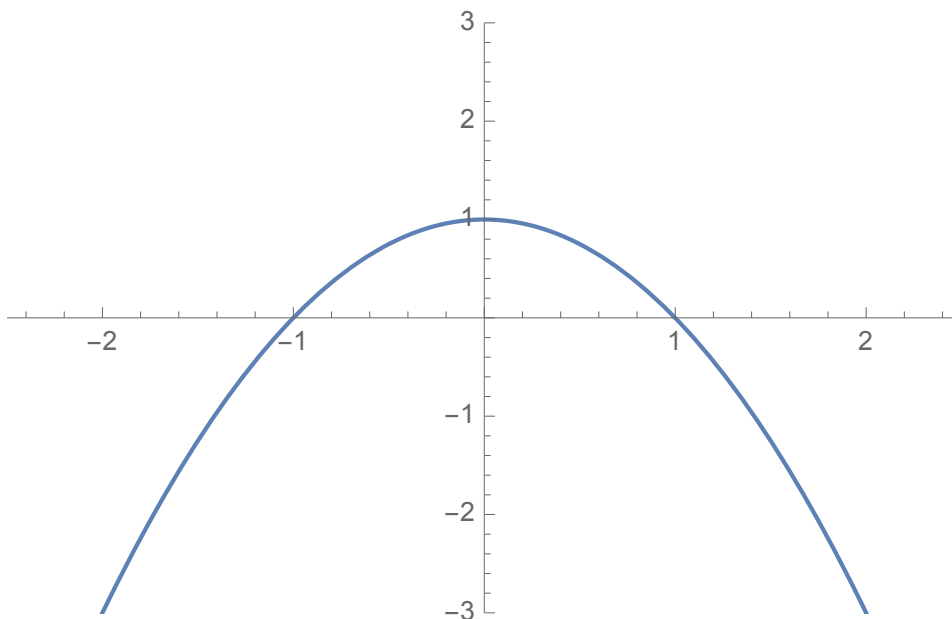
t	0	2	4	6	8	10	12
P	64.65	66.25	66.732	65.727	65.141	64.874	60.958

(i) Does $f'(6)$ appear to be positive or negative? What does this tell you about the number of households with cable television?

(ii) Estimate $f'(2)$. Estimate $f'(10)$. Explain what each is telling you, in terms of cable television.

(iii) Is $f''(4)$ positive or negative? Explain.

5. (20pts) The following is the graph of **the first derivative** $f'(x)$:

i) Find the intervals on which $f(x)$ is increasing and those on which $f(x)$ is decreasing.

ii) Find the intervals on which $f(x)$ is concave up and those on which $f(x)$ is concave down.

iii) Assume $f(0) = 1$. Which of the following is possible: $f(1) = 3$ or $f(1) = 0$. Explain.

iv) Sketch a graph of $f''(x)$.

v) Assume $f(0) = 1$. Sketch a graph of $f(x)$.

6. (20pts, 2pts for each question) True/False or Fill-in

(1) If $f(x) = x^2 + 2x + 1$ then $f(3) = 15$.

(2) The function $D = f(r)$ given by $D = -3r + 10$ is an increasing function of r.

(3) If the relative rate the change for f is constant, then f is _____ function.

(4) The average rate of change of a function is the slope of [SELECT ONE]

- secant between two points on the graph, or
- tangent at a given point to the graph.

(5) If $y = f(x)$ then $\frac{dy}{dx}$ and $f'(x)$ mean the same thing.

(6) The f is negative on an interval, then the derivative of f is decreasing on that interval.

(7) If $f'' > 0$ on an interval then f is _____ on that interval.

(8) The instantaneous rate of change for e^x is 1 everywhere.

(9) There is a function with $f'' = 0$ everywhere.

(10) If your answer to question (9) is YES, give an example. If the answer is NO, explain.