

**General Instructions:** Write your name on only the outside of your blue book. Do all your work inside your blue book. Indicate your answers clearly. Please put the test inside your blue book as you leave. Do not write on this sheet. Point values for each of the following problems are as indicated.

1. (10 points each) Sketch the graph of each of the following functions.

(a)

$$y = 100|x + 3000| + 10$$

(b)

$$y = 20(x + 1)^2 - 20$$

(c)

$$y = 3x^2 - 6x - 18$$

(d)

$$y = \frac{x}{x^2 - 625}$$

(e)

$$y = \ln(x - 1)$$

(f)

$$y = 3e^{2x-1}$$

(g)

$$y = (x + 4)(x + 3)(x + 2)x(x - 1)(x - 3)$$

2. (10 points each) Solve the following inequalities.

(a)

$$|4000x + 8| < 3000$$

(b)

$$\frac{(x - 2)(x + 1)}{(x - 1)(x - 4)} \leq 0$$

(c)

$$\ln(x + 10) \leq 0$$

3. (10 points) Solve the following system of equations

$$x + y + z = 1$$

$$x - y + z = 1$$

$$x + y = 0$$

4. (10 points) For the function

$$f(x) = x^2 - 2x^3 - 18x^2 + 6x + 45$$

list all possible rational roots, determine all real roots and sketch the graph.

5. (10 points) A certain radioactive isotope has a half-life of 12,000 years. An initial sample of 3 grams is left to decay for 79,865 years. How much remains?

6. (10 points) Find the amount of time that it would take for an investment of \$235,728 to become \$2,000,000 if it is left in an account that bears 12.85% interest that is compounded continuously?

7. (10 points) Which is the better of the two investment options?

(a) \$1000 invested at 6.3125% interest compounded quarterly for 3 years;

(b) \$1000 invested at 6.125% interest compounded continuously for 3 years.