1. Solve the following systems of linear equations algebraically. Show all your work. If the system is dependent or inconsistent, clearly state so.

(a). $\begin{cases} -3x + 2y = -4 \\ 2x + 4y = 8 \end{cases}$ **(b).** $\begin{cases} x - 3y = 5 \\ -3x + 9y = -10 \end{cases}$

2. A movie theater charges \$9 for adults and \$5.50 for children. On the opening day for the latest Harry Potter movie, the theater fills all 500 of its seats. If they collected \$3870, how many children and how many adults watched the movie?
Set up, ***but do not solve***, the system of equations needed to determine how many children and how many adults watched the movie. Clearly indicate what x and y represent.

3. A manufacturer of DVD players has monthly fixed costs of \$9800 and variable costs of \$65 per unit for one particular model. The company sells this model to dealers for \$100 each.

(a). For this model DVD player, write the function for the monthly total costs, revenue, and profit.

(b). Find $R(250)$ and interpret the answer.

(c). Find the marginal profit and write a sentence that explains its meaning.

(d). Find the break-even point.

4. Find the market equilibrium point for the following demand and supply functions.

(a). Demand: $p = 600 - 3q$ Supply: $p = 21q + 96$

(b). Demand: $p = 2q^2 + q + 40$ Supply: $p = 200 - q - \frac{1}{4}q^2$

5. Solve the following equations for x: **(a).** $x^2 - 6 = x + 6$ **(b).** $3x^2 - 10x + 8 = 0$

6. Given the parabola $y = -3x + x^2$ [Do this problem without a calculator.]

(a). Find the x and y coordinates of the vertex. **(b).** Is it a maximum or a minimum?

(c). Find the x- and y-intercepts **(d).** Sketch the graph and label 3 pts.

7. The percent of total work force that is female is given by $p(t) = -0.0034t^2 + 0.45t + 34$, where t is the number of years past 1970. In what year is the percent of females in the workforce a maximum? What is that maximum persentage?

8. The monthly charge for water in a small town is given by $f(x) = \begin{cases} 62 & \text{if } 0 \le x \le 25 \\ 62 + 0.5(x - 25) & \text{if } x > 25 \end{cases}$ where x is water usage in *hundreds* of gallons and $f(x)$ is in dollars.

(a). Find the monthly usage charge when the water usage is **(i)** 80 gallons **(ii)** 4000 gallons

(b). Graph the function for $0 \le x \le 100$.

9. Solve the following inequalities. Write your answers in interval notation and graph it on the number line.

(a). $2x + 1 > 4$ **(b).** $2(7x - 3) \le 12x + 16$

10. Solve the following inequality. Graph the solution on the number line. $x^2 - x - 6 \le 0$

11. Given the system of inequalities $\begin{cases} x+4y \geq 10 \\ 2x+6y \geq 18 \\ x \geq 0 \\ y \geq 0 \end{cases}$

(a). Shade the feasible region **(b).** Find the corners

(c). Minimize $f = 3x + 2y$ subject to the same constraints

12. Solve the following inequalities. Graph the solution on the number line.

(a). $x^2 - x - 6 \leq 0$ **(b).** $\dfrac{(x-3)^2}{(x+1)(x+2)} \geq 0$

13. **(a).** Write in exponential form: $\log_3 81 = 4$ **(b).** Write in logarithmic form: $8^{1/3} = 2$

14. Graph the following functions(without a calculator) and clearly label 2 points.

(a). $y = 2e^x$ **(b).** $y = 3^{-x}$ **(c).** $y = \log_4 x$

15. Use properties of logarithms to expand the following logarithms as far as you can.

(a). $\log_2 x^3 y^4$ **(b).** $\log \frac{1}{\sqrt{A}}$ **(c).** $\log_b[P(1+r)^t]$

16. Use properties of logarithms to combine the following into a single logarithm.

(a). $\log x^3 - 2\log y$ **(b).** $\log_2(x-1) + \log_2(x+1) - \dfrac{1}{2}\log_2 x$

17. Use the change of base formula to rewrite and/or evaluate the following.

(a). $\log_7 21$ **(b).** $y = \log_2 x$

18. Solve the following equations for x.

(a). $3^{5x} = 81$ **(b).** $\log_9 x = \dfrac{1}{2}$

19. After an advertising campaign, the monthly sales for stereos at a store is given by $S = 50,000(2)^{-0.85x}$ S is the monthly sales (in dollars) and x is the number of months that have passed since the end of the advertising.

(a). What is the monthly sales right at the end of the advertising?

(b). What is the monthly sales after 3 months?

20. An initial amount of 15 g of radioactive iodine decays according to $A(t) = 15e^{-0.087t}$ where t is given in days.

(a). How much is left after 2 days?