1. A fishing reel manufacturer has determined the cost of manufacturing 150 reels is $5775 the
cost of manufacturing 375 reels is $12,562.
   a) Find a formula for the linear cost function $C(x)$.
   b) Find the total cost of producing 500 items.
   c) What is the average cost of producing 500 items?
   d) What is the marginal cost per reel?

2. An insurance company claims that for $x$ thousand policies, its monthly revenue in dollars is
given by $R(x) = 125x$ and its monthly cost in dollars is given by $C(x) = 100x + 5000$. Find
the break-even point.

3. The supply and demand for radial tires in dollars is given by
   
   \[
   supply: p = \frac{3}{2}q; \quad demand: p = 81 - \frac{3}{4}q.
   \]
   a) Find the equilibrium quantity.
   b) Find the equilibrium price.

4. Let $f(x) = (x - 2)^2 - 6$
   a) Find the vertex
   b) State the domain and Range
   c) Find the maximum or minimum value
   d) Sketch the graph of the quadratic function

5. The revenue and cost functions of a certain commodity are given by $R(x) = 900x - 3x^2$ and
   $C(x)450x + 5000$, with $20 \leq x \leq 150$. Find the following:
   a) The break-even point (to the nearest tenth)
   b) The maximum profit
   c) For what $a$-values will a loss occur?

6. Graph the exponential function $f(x) = 2^x - 3$
7. The table shows the age-adjusted death rates (per 100,000 population) for heart disease

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rate</td>
<td>492.7</td>
<td>412.1</td>
<td>321.8</td>
<td>257.9</td>
<td>240.4</td>
</tr>
</tbody>
</table>

a) Find an exponential function for this data, with \( t = 0 \) corresponding to 1970/
c) By trial and error using the function from part a, estimate the year in which the death rate will fall to 100.

8. Rewrite each logarithmic statement as an equivalent exponential statement.
   a) \( \log_2 128 = 7 \)
   b) \( \log_5 \frac{1}{125} = -3 \)
   c) \( \ln(x + 1) = 4 \)

9. Rewrite each exponential statement as an equivalent logarithmic statement.
   a) \( 3^4 = 81 \)
   b) \( 10^2 = 100 \)
   c) \( e^{x-2} = 25 \)

10. Rewrite \( 3 \log_b M + 2 \log_b N - \frac{1}{2} \log_b p \) as a logarithmic expression.

11. Completely expand \( \log_b \sqrt[3]{\frac{m^5n^4}{t^2}} \)

In problems 14-20, solve the following equations.

12. \( 9^{x-3} = 27^{3x+5} \)
13. \( 5^{2x-5} = 3^{7-3x} \)
14. \( 5e^{x+1} = 8 \)
15. \( \log_2 x + \log_2 (x - 2) = 3 \)
16. \( \ln(x + 3) - \ln x = \ln 2 \)

17. Find the proceeds for a loan of $35,800 if the length of the loan is 183 days with a discount rate of 9.1%.

18. A small business borrows $50,000 for expansion at 12% compounded monthly. The loan is due in 4 years. How much interest will the business pay?

19. Ron is saving for a new engine to put into his car. At the end of each month he puts $125 into a savings account that pays 3.5% interest compounded monthly. How much is in the account after 3 years?

20. Rebecca wants to buy a new $53,500 BMW 3-series car in 5-years. How much money does she need to deposit into a sinking fund at the end of each quarter that pays 6.1% compounded quarterly so that she will have enough money to make the purchase?
21. What lump sum deposited today at 8% compounded monthly for 15 years will yield the same final amount as $500 deposited at the end of each month at 6.5% compounded monthly for 10 years?

22. The Gilbert couple plan on buying a $450,000 home in Santa Cruz, California. They will put $90,000 down and finance the rest at 5.5% interest compounded monthly for 30 years. Find their monthly payments.

23. Solve the system of linear equations using matrices a row reduction:
\[
\begin{align*}
    x + y - 5z &= -18 \\
    3x - 3y + z &= 6 \\
    x + 3y - 2z &= -13
\end{align*}
\]

24. To get the necessary funds for a planned expansion, a small company took out three loans totaling $25,000. The company was able to borrow some of the money at 8% interest. It borrowed $2000 more than one-half the amount of the 8% loan at 10%, and the rest at 9%. The total annual interest was $2220. How much did the company borrow at each rate?

25. The manufacturing process requires that oil refineries manufacture at least 2 gallon of gasoline for every gallon of fuel oil. To meet the winter demand for fuel oil, at least 3 million gallons a day must be produced. The demand for gasoline is no more than 12 million gallons per day. It takes 0.25 hour to ship each million gallons of gasoline and 1 hour to ship each million gallons of fuel oil out of the warehouse. No more than 6.6 hours are available for shipping. If the refinery sells gasoline for $1.25 per gallon and fuel oil for $1 per gallon, how much of each should be produced to maximize revenue? Find the maximum revenue. Use the graphical method to solve.

26. Use the Simplex Method to Solve:
\[
\begin{align*}
    z &= 300x_1 + 200x_2 + 100x_3 \\
    \text{Subject to:} & \quad x_1 + x_2 + x_3 \leq 100 \\
    & \quad 2x_1 + 3x_2 + 4x_3 \leq 320 \\
    & \quad 2x_1 + x_2 + x_3 \leq 160
\end{align*}
\]

27. For the following experiment write out an equally likely sample space, and then write the indicated event in set notation.
An unprepared student takes a three-question true-false quiz in which he flips a coin to guess the answers. If the coin is heads, he guesses true, and if the coin is tails, he guesses false.

a) The student guesses true twice and guess false once.
b) The student guesses all false
c) The student guess true once and guesses false once.
28. In a certain game, you and your opponent each roll a die. If your die is higher than your opponent’s, you win, otherwise your opponent wins.
   a) Write out the sample space.
   b) Determine the probability that you will win
   c) Determine the probability that your opponent will win.

29. One card is drawn from an ordinary deck of 52 cards. Find the probabilities of drawing the following cards.
   a) Less than a 5
   b) A club or a 7
   c) A black card or a King
   d) A red card or a face card

30. An automobile manufacturer produces 6 models, each available in 8 different colors, with 4 different upholstery fabrics and 3 interior colors. How many varieties of the auto are available?

31. A social security number has 9 digits. How many social security numbers are possible? The U.S. population in 2005 was approximately 296 million. Was it possible for every U.S. resident to have a unique social security number?

32. A real-estate agent has the names of seven potential clients interested in selling their homes.
   a) In how many ways can she arrange her schedule if she calls on all 7.
   b) In how many ways can she arrange her schedule if she can call on only 5 of the 7?

33. In a club with 25 members, how many ways can they select a president, treasurer, and a secretary?

34. A gardener has 4 flower beds to plant. He has 4 colors of impatients, 3 colors of begonias, and 5 kinds of daylilies to choose from. Treating each plant-color combination as a selection, and assuming that each flower bed is planted with only one selection, how many ways can he plant the 4 flower beds if
   a) order matters
   b) order does not matter.

35. Five cards are drawn from an ordinary deck. In how many ways is it possible to draw
   a) only ace’s, jack, and kings
   b) exactly 3 clubs
   c) exactly 2 jacks, queens, or kings
36. A container contains 12 diesel engines. The company chooses 8 engines at random, and will not ship the container if any of the engines are defectives. Find the probability that a container will be shipped even though it contains 2 defectives if the sample size is 8.

37. A radio station runs a promotion at an auto show with a money box with 10 $100 tickets, 12 $50 tickets, and 20 $25 tickets. The box contains an additional 200 “dummy” tickets with no value. Three tickets are randomly drawn. Find the following probabilities:
   a) All $100 tickets
   b) Exactly two $25 tickets and no other money winners
   c) One ticket of each amount of money
   d) No tickets with money
   e) At least one money ticket.

38. A bridge hand consists of 13 cards from a deck of 52. Find the probability of having 2 10’s and 3 jacks.

39. On the first day of school, the teacher of a multicultural first-grade class found that in her class of 23 students, 10 spoke only English, 6 spoke only Spanish, 4 spoke only Russian, 3 spoke only Vietnamese, and 2 spoke only Hmong. The children were assigned randomly to groups of 5. Find the probability that a group included the following:
   a) 2 English speaking and 3 Russian speaking children
   b) All English speaking children
   c) No English speaking
   d) At least two children who spoke Vietnamese or Hmong

40. A cellular phone manufacturer randomly selects 5 of every 100 phones from the assembly line and tests them. If at least 4 of the 5 pass inspection, the batch of 100 is considered acceptable. Find the probability that a batch is considered acceptable if it contains the following.
   a) 2 defective phones
   b) no defective phones
   c) 3 defective phones