6.3

Key

AAT Polynomial Applications

1. The function $C(s) = 0.013s^2 - s - 7$ estimates the wind chill temperature *C(s)* at 0°F for wind speeds *s* from 5 to 30 miles per hour. Estimate the wind chill temperature at 0°F if the wind speed is 20 miles per hour.

$-21.8°F$

2. The intensity of light emitted by a firefly can be determined by $L(t) = 10 + 0.3t + 0.4t^2 - 0.01t^3$, where *t* is temperature in degrees Celsius and *L(t)* is light intensity in lumens. If the temperature is 30°C, find the light intensity.

109 lumens

3. The power generated by a windmill is a function of the speed of the wind. The approximate power is given by the function $P(x) = \frac{s^3}{1000}$, where *s* represents the speed of the wind in kilometers per hour. How much power is generated if the wind speed is 18km/h?

5.832

4. The projected population in thousands for a city over the next several years can be estimated by the function $P(x) = x^3 + 2x^2 - 8x + 520$, where x is the number of years since 2000. Estimate the population for 2016.

5000 thousand people or 5,000,000 people

5. The number of cable TV systems after 1985 can be modeled by the function $C(t) = -43.2t^2 + 1343t + 790$, where *t* represents the number of years since 1985. What is the meaning of the maximum/minimum and roots in context to the problem?
   a. Max/Min meaning: max is peak of TV sales at a certain # of years
   b. Roots meaning: Positive root is point where you have no TV sales

6. During a respiratory cycle, the volume of air in liters in the human lungs can be described by the function $V(t) = 0.173t + 0.152t^2 - 0.035t^3$, where *t* is the time in seconds.
   a. About how long does a respiratory cycle last?

5.3 sec

   b. Estimate the time in seconds from the beginning of this respiratory cycle for the lungs to fill to their maximum volume of air.

3.45sec

7. Stephan has a set of plans to build a wooden box. He wants to reduce the volume of the box to 105 cubic inches. He would like to reduce the length of each dimension in the plan by the same amount. The plans call for the box to be 10 inches by 8 inches by 6 inches. Write and solve a polynomial equation to find out how much Stephen should take from each dimension.

3 in

8. The height of a box that Joan is shipping is 3 inches less than the width of the box. The length is 2 inches more than twice the width. The volume of the box is 448 in^3. What are the dimensions of the box?

w = 7in
h = 4in
L = 16in

9. The width of a rectangular prism is *w* centimeters. The height is 2 centimeters less than the width. The length is 4 centimeters more than the width. If the volume is 8 times the measure of the length, find the dimensions of the prism.

w = 4in
h = 2in
L = 8in

10. A box measures 12 by 16 by 18 inches. The manufacturer will increase each dimension of the box by the same number of inches and have a new volume of 5985. How much is added to each side and what are the new dimensions?

3in
15 × 19 × 21

11. A box measures 9 by 12 by 17 inches. The manufacturer will increase each dimension of the box by the same number of inches so that the new volume is 680 less than five times the original. How much is added to each side and what are the new dimensions?

8in
17 × 20 × 25

12. A box measures 28 by 17 by 15 inches. The manufacturer will decrease each dimension of the box by the same number of inches so that the new area is 252 more than one-fifth the original. How much is added to each side and what are the new dimensions?

7in
21 × 10 × 8

13. The height of a square pyramid is 3 meters shorter than the side of its base. If the volume of the pyramid is $432m^3$, how tall is it? Use the formula $V = \frac{1}{3}Bh$.

9 meters