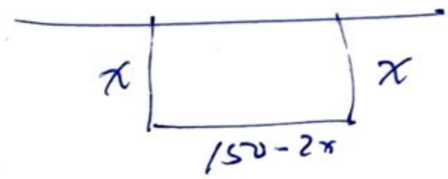
SOLUTIONS

Lesson 1 Practice Problems

1. A rectangular schoolyard is to be fenced in using the wall of the school for one side and 150 meters of fencing for the other three sides. The area $A(x)$ in square meters of the schoolyard is a function of the length x in meters of each of the sides perpendicular to the school wall.



   a. Write an expression for $A(x)$.

   $A(x) = x(150 - 2x)$

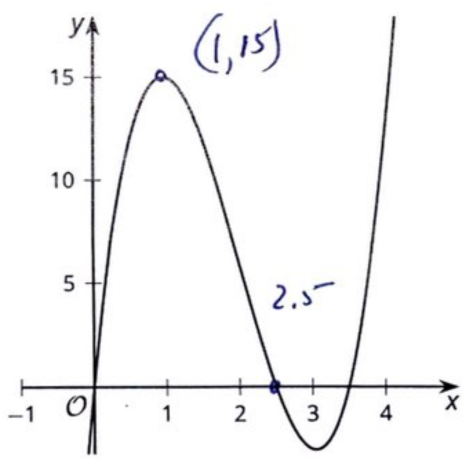
   b. What is the area of the schoolyard when $x = 40$?

   $A(40) = 40(150 - 2(40)) = 2800 \text{ m}^2$

   c. What is a reasonable domain for A in this context?

   D: $0 \leq x < 75$

2. Noah finds an expression for $V(x)$ that gives the volume of an open-top box in cubic inches in terms of the length x in inches of the cutout squares used to make it. This is the graph Noah gets if he allows x to take on any value between -1 and 5.



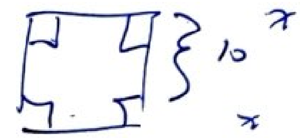
   a. What would be a more appropriate domain for Noah to use instead?

   $0 < x < 2.5$

   b. What is the approximate maximum volume for his box?

   15 in^3

3. Mai wants to make an open-top box by cutting out corners of a square piece of cardboard and folding up the sides. The cardboard is 10 centimeters by 10 centimeters. The volume $V(x)$ in cubic centimeters of the open-top box is a function of the side length x in centimeters of the square cutouts.



   a. Write an expression for $V(x)$.

   $V(x) = x(10-2x)^2$

   b. What is the volume of the box when $x = 3$?

   $V(3) = 3(10-2(3)) = 12 \text{ cm}^3$

4. The area of a pond covered by algae is $\frac{1}{4}$ of a square meter on day 1 and it doubles each day. Complete the table.

day	1	2	3	4	5	6
area of algae in square meters	1/4	1/2	1	2	4	8

(From Unit 1, Lesson 2.)

5. Here is a table showing values of sequence p. Define p recursively using function notation.

n	$p(n)$
1	5,000
2	500
3	50
4	5
5	0.5

$\frac{1}{10}$

$\begin{cases} p(1) = 5000 \\ p(n) = \frac{1}{10}\, p(n-1) \end{cases}$

(From Unit 1, Lesson 6.)

6. The table shows two sloth populations growing over time.

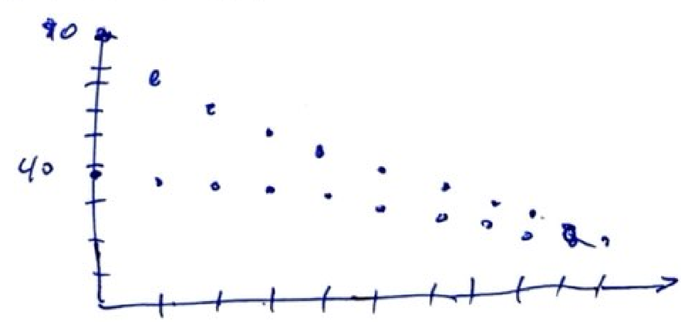
time (years since 1990)	population 1 (thousands)	population 2 (thousands)	
0	90.0 .85	39	-2
1	76.5	37	-2
2	65.0	35	
3	55.3	33	
4	47.0	31	
5	39.95	29	
6	~ 33.96	27	
7	28.86	25	
8	24.53	23	

a. Describe a pattern in how each population changed from one year to the next.

P1 is 85% of the prior year ; P2 loses 2000 each year.

b. These patterns continued for many years. Based on this information, fill in the extra rows in the table.

c. On the same axes, draw graphs of the two populations over time.



d. Does Population 2 ever equal Population 1? If so, when? Explain or show your reasoning.

yes. roughly in year 9 they have the same value

(From Unit 1, Lesson 10.)

Lesson 2 Practice Problems

1. Select **all** polynomial expressions that are equivalent to $6x^4 + 4x^3 - 7x^2 + 5x + 8$.

   A. $16x^{10}$

   B. $6x^5 + 4x^4 - 7x^3 + 5x^2 + 8x$

   C. $6x^4 + 4x^3 - 7x^2 + 5x + 8$

   D. $8 + 5x + 7x^2 - 4x^3 + 6x^4$

   E. $8 + 5x - 7x^2 + 4x^3 + 6x^4$

2. Each year a certain amount of money is deposited in an account which pays an annual interest rate of r so that at the end of each year the balance in the account is multiplied by a growth factor of $x = 1 + r$. \$500 is deposited at the start of the first year, an additional \$200 is deposited at the start of the next year, and \$600 at the start of the following year.

   a. Write an expression for the value of the account at the end of three years in terms of the growth factor x.

   $f(x) = 500x^3 + 200x^2 + 600x$

   b. What is the amount (to the nearest cent) in the account at the end of three years if the interest rate is 2%?

   $f(1.02) = 1350.684 \approx \$1350.68$

3. Consider the polynomial function p given by $p(x) = 5x^3 + 8x^2 - 3x + 1$. Evaluate the function at $x = -2$.

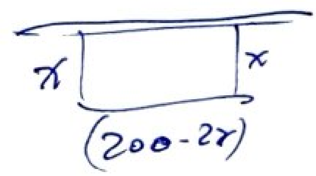
   $p(-2) = -1$

4. An open-top box is formed by cutting squares out of a 5 inch by 7 inch piece of paper and then folding up the sides. The volume $V(x)$ in cubic inches of this type of open-top box is a function of the side length x in inches of the square cutouts and can be given by $V(x) = (7 - 2x)(5 - 2x)(x)$. Rewrite this equation by expanding the polynomial.

$$= (35 + -14x - 10x + 4x^2)x$$

$$= 4x^3 - 24x^2 + 35x$$

5. A rectangular playground space is to be fenced in using the wall of a daycare building for one side and 200 meters of fencing for the other three sides. The area $A(x)$ in square meters of the playground space is a function of the length x in meters of each of the sides perpendicular to the wall of the daycare building.



a. What is the area of the playground when $x = 50$?

$A = 50 \times 100 = 5000 \text{ m}^2$

b. Write an expression for $A(x)$.

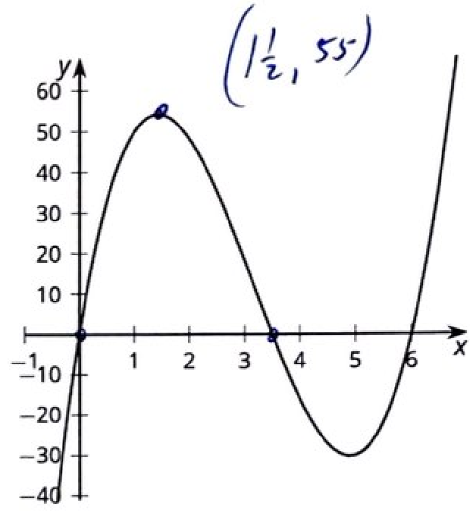
$A(x) = x(200 - (2x))$

c. What is a reasonable domain for A in this context?

$0 < x < 100$

(From Unit 2, Lesson 1.)

6. Tyler finds an expression for $V(x)$ that gives the volume of an open-top box in cubic inches in terms of the length x in inches of the square cutouts used to make it. This is the graph Tyler gets if he allows x to take on any value between -1 and 7.



a. What would be a more appropriate domain for Tyler to use instead?

$0 < x < 3\frac{1}{2}$

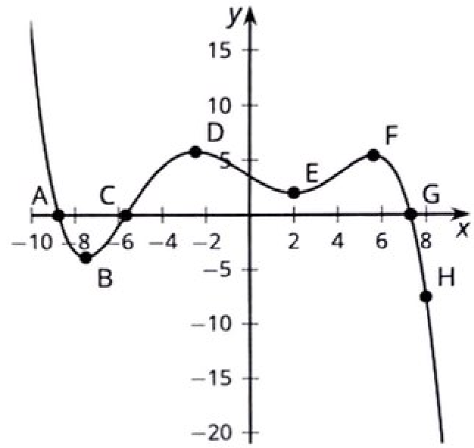
b. What is the approximate maximum volume for his box?

55 in^3

(From Unit 2, Lesson 1.)

Lesson 3 Practice Problems

1. Select **all** points where relative minimum values occur on this graph of a polynomial function.



A. Point A

B. Point B

C. Point C

D. Point D

E. Point E

F. Point F

G. Point G

H. Point H

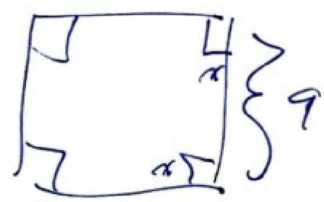
2. Add one term to the polynomial expression $14x^{19} - 9x^{15} + 11x^4 + 5x^2 + 3$ to make it into a 22nd degree polynomial.

$x^{22} + \ldots$

3. Identify the degree, leading coefficient, and constant value of each of the following polynomials:

	degre	leading Coef	Constant
a. $f(x) = x^3 - 8x^2 - x + 8$	3	1	8
b. $h(x) = 2x^4 + x^3 - 3x^2 - x + 1$	4	2	1
c. $g(x) = 13.2x^3 + 3x^4 - x - 4.4$	~~3~~ 4	~~13.2~~ 3	-4.4

4. We want to make an open-top box by cutting out corners of a square piece of cardboard and folding up the sides. The cardboard is a 9 inch by 9 inch square. The volume $V(x)$ in cubic inches of the open-top box is a function of the side length x in inches of the square cutouts.



a. Write an expression for $V(x)$.

$V(x) = x(9-2x)^2$

b. What is the volume of the box when $x = 1$?

$V(1) = 1(7^2) = 49 \text{ in}^3$

c. What is a reasonable domain for V in this context?

$0 < x < \cancel{8}\ 4\frac{1}{2}$

(From Unit 2, Lesson 1.)

5. Consider the polynomial function p given by $p(x) = 7x^3 - 2x^2 + 3x + 10$. Evaluate the function at $x = -3$.

$p(-3) = -206$

(From Unit 2, Lesson 2.)

6. An open-top box is formed by cutting squares out of an 11 inch by 17 inch piece of paper and then folding up the sides. The volume $V(x)$ in cubic inches of this type of open-top box is a function of the side length x in inches of the square cutouts and can be given by $V(x) = (17 - 2x)(11 - 2x)(x)$. Rewrite this equation by expanding the polynomial.

(From Unit 2, Lesson 2.)

$$V(x) = (187 - 34x - 22x + 4x^2)\,x$$

$$= 4x^3 - 56x^2 + 187x$$