

Algebra II  
Practice Semester Exam  
Specification Sheet

1. Properties of real numbers
  2. Procedure (write procedure or process)
  3. Concept development/linkage
  4. Theorem/factual knowledge (of theorems and rules)
  5. Theorem/factual knowledge (of theorems and rules)
  6. Reading translation ( math to English, English to math)
- 
1. Evaluate algebraic expressions
  2. Simplify algebraic expressions
  3. Rewrite formulas and equations
  4. Solve inequality (one variable)
  5. Solve absolute value equality/inequality
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6. Identify functions and their graphs
  7. Slope – rate of change application
  8. Rewrite literal equations and formulas
  9. Find domain/range of a function
  10. Write linear equation
  11. Graph/evaluate piecewise functions
  12. Linear equation
  13. Graph linear equation/inequality
  14. Linear inequality
  15. Use functions to solve real-life problems
  16. Solve system of linear equations (various methods)
  17. Graph system of equations/inequalities
  18. Solve system of linear equations (various methods)
  19. Solve system of linear equations (3 variables)
  20. Linear programming application
  21. Matrix operations
  22. Matrix operations
  23. Matrix application
  24. Determinants
  25. Solve system of linear equations using inverse matrix
  26. Solve quadratic equations by factoring
  27. Forms of quadratic equations (vertex, intercept, standard)
  28. Solve quadratic equations by finding square roots
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29. Solve quadratic equations by completing the square
  30. Solve quadratic equations using quadratic formula
  31. Simplify complex numbers
  32. Discriminant (determine types of roots of quadratic equation)
  33. Graph quadratic functions
  34. Graph quadratic inequalities
  35. Graph polynomial functions
  36. Evaluate polynomial functions using direct or synthetic substitution
  37. Solve quadratic equations with complex solutions
  38. Polynomial operations
  39. Factor polynomials
  40. Solve polynomials
  41. Rational zeros of polynomial functions
  42. Apply Theorems (remainder, factor or rational zero)
  43. Analyze graphs of polynomial functions / identify end behavior
  44. Graph – higher order polynomial functions

**Free Response**  
**Algebra II**  
**Practice Semester Exam**

1. Write the Associative Property for Addition of Real Numbers in general form.

Illustrate its use with a numeric expression.

2. Write the procedure for solving a system of linear equations using the substitution method.

3. Use synthetic division to divide  $x^3 - 2x^2 - 5x - 12$  by  $x - 4$ .

Explain how the results can be used to write the polynomial expression in factored form.

4. Write the discriminant of the general quadratic equation  $ax^2 + bx + c = 0$ .

Explain how it is used to determine the number of real solutions of the equation  $5x^2 - 3x + 1 = 0$ .

5. Write the Factor Theorem. Explain how it can be used to find zeroes of a polynomial function.

6. The solution set of real numbers greater than  $-4$  and less than or equal to  $10$  can be written using mathematical notation.

Write this solution set as it would be written in set notation.

Algebra II Practice Semester Exam

1. Evaluate  $b^2 - 4ac$  for  $a = -3$ ,  $b = 1$ , and  $c = -2$ .

[A] -23

[B] -17

[C] 17

[D] 25

2. Which is a simplified form of the expression

$$12(x-1) - \frac{2}{3}(6x-18)?$$

[A]  $8x - 24$

[B]  $6x + 6$

[C]  $8x$

[D]  $16x - 24$

3. Which is a solution for  $y$  in the equation

$$3x + 2y = 5x - 6 + y?$$

[A]  $y = -2x + 6$

[B]  $y = 2x - 6$

[C]  $y = 8x - 6$

[D]  $y = 8x + 6$

4. Which of the following expresses all of the solutions for the compound inequality below?

$$3(z-8) \geq 3 \text{ and } 5 \geq 2+3z$$

[A] 1 and 9

[B]  $1 \leq z \leq 9$

[C]  $z \leq 1$  and  $z \geq 9$

[D] no solution

5. Rewrite the absolute value inequality as a compound inequality for  $|x+6| < 7$ .

[A]  $-13 < x < 1$

[B]  $x < -13$  or  $x > 1$

[C]  $x > -13$  or  $x < 1$

[D] no solution

6. Which of the following is a function?

[A]  $x = y^2 + 4$

[B]  $\{(6, -5), (6, 2), (2, -1)\}$

[C]  $\{(-1, 6), (3, 6), (-5, 6)\}$

[D]  $3x^2 + 6y^2 - 5 = 1$

Algebra II Practice Semester Exam

7. You are hiking in the mountains. When you begin the hike at 1:00 p.m. the temperature is  $84^{\circ}\text{F}$ . When you return at 4:00 p.m., the temperature is  $57^{\circ}\text{F}$ . What is the average rate of change in the temperature?

- [A]  $-27^{\circ}\text{F}$  per hour  
 [B]  $-9^{\circ}\text{F}$  per hour  
 [C]  $9^{\circ}\text{F}$  per hour  
 [D]  $-27^{\circ}\text{F}$  per hour

8. Rewrite the formula below for surface area of a right circular cylinder to solve for the height,  $h$ .

$$A = 2\pi rh + 2\pi r^2$$

[A]  $h = \frac{2\pi r^2 - A}{2\pi r}$

[B]  $h = \frac{A}{2\pi r^2} - 2\pi r$

[C]  $h = A - 2\pi r - 2\pi r^2$

[D]  $h = \frac{A}{2\pi r} - r$

9. What is the range of the following relation?

$$\{(-2, 0), (1, -3), (5, -2)\}?$$

- [A]  $\{-2, 1, 5\}$   
 [B]  $\{2, -1, -5\}$   
 [C]  $\{-3, -2, 0\}$   
 [D] all real numbers

10. Write the standard form of the equation of the line that passes through the point  $(-1, 2)$  and is parallel to the line  $5x + 2y = -1$ .

- [A]  $5x + 2y = 9$   
 [B]  $5x + 2y = -1$   
 [C]  $2x - 5y = -8$   
 [D]  $2x - 5y = -12$

11. Evaluate  $f(-3)$  for the piecewise function

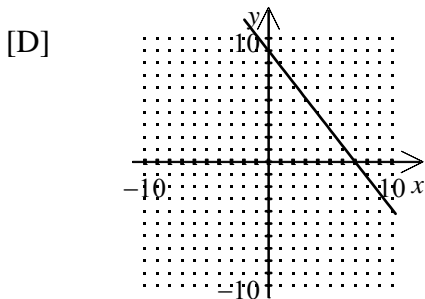
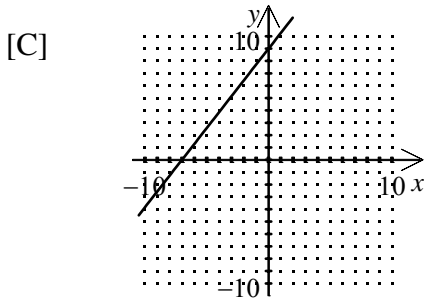
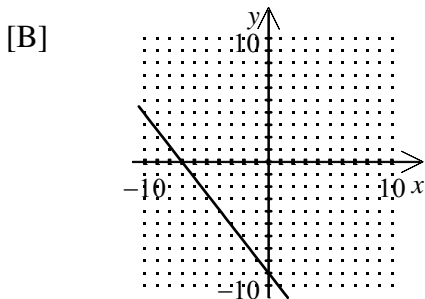
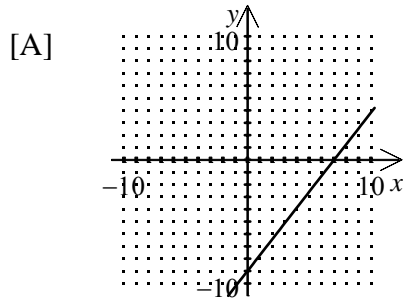
$$f(x) = \begin{cases} x, & x \leq 0 \\ x^2 - 3x, & x > 0 \end{cases}$$

- [A]  $f(-3) = -18$   
 [B]  $f(-3) = -3$   
 [C]  $f(-3) = 0$   
 [D]  $f(-3) = 18$

12. What is the value of  $n$  if  $\frac{9}{7}n + \frac{2}{3} = \frac{5}{14}$ ?

- [A]  $-\frac{67}{42}$   
 [B]  $-\frac{39}{98}$   
 [C]  $-\frac{13}{54}$   
 [D]  $\frac{43}{54}$

13. Graph the linear equation  $9x - 7y = 63$ .



14. The inequality  $3x - 2 \leq 4y + 5$  can be represented by which of the following?

[A]  $y \geq \frac{3}{4}x - \frac{7}{4}$

[B]  $y \leq \frac{3}{4}x - \frac{7}{4}$

[C]  $y \geq 3x - 7$

[D]  $y \geq \frac{4}{3}x - \frac{4}{7}$

15. In 2000 the average price of a home in West County was \$95,000. By 2007 the average price of a home was \$123,000. Which of the following is a linear model for the price of a home,  $P$ , in West County in terms of the year,  $t$ ? Let  $t = 0$  correspond to 2000.

[A]  $P = 123,000 - 4,000t$

[B]  $P = 95,000 + 4,000t$

[C]  $P = 123,000 - 28,000t$

[D]  $P = 28,000 + 95,000t$

16. Solve the following linear system.

$$5x - 2y = 8$$

$$y = \frac{5}{2}x + 3$$

[A]  $(0, -4)$

[B]  $(2, 8)$

[C] infinitely many solutions

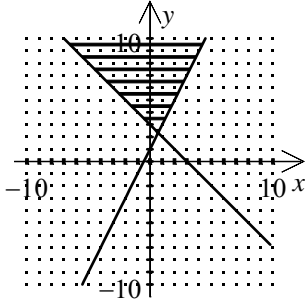
[D] no solution

17. Graph the following system of inequalities.

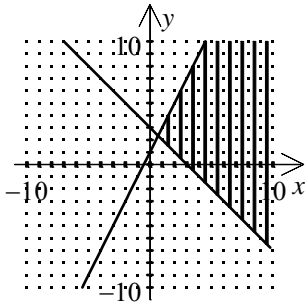
$$y \leq 2x + 1$$

$$y \geq -x + 3$$

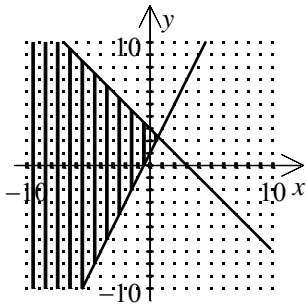
[A]



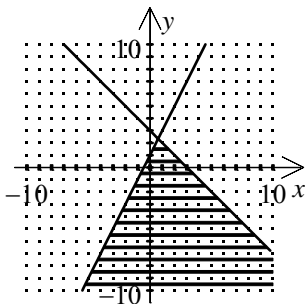
[B]



[C]



[D]



18. Find the  $x$ -coordinate of the solution to the linear system.

$$3x - 4y = -1$$

$$x + y = -5$$

[A] -5

[B] -4

[C] -2

[D] no solution

19. What is the  $x$ -coordinate of the solution to the following system of equations?

$$2x + y - z = 5$$

$$x + 3z = 14$$

$$-2x - 3y + 2z = 2$$

[A] 14

[B] 5

[C] -1

[D] -2

20. Using linear programming procedures, the equation  $C = 4x + 7y$  is to be maximized subject to the following constraints:

$$x \geq 0$$

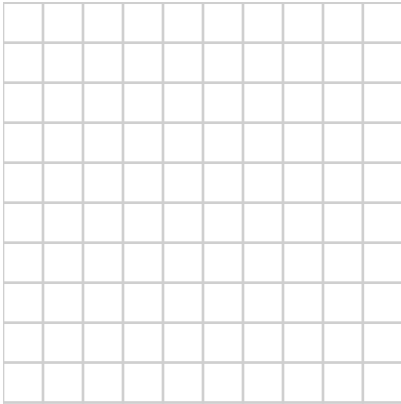
$$y \geq 0$$

$$x + y \geq 2$$

$$-3x + 4y \leq 8$$

$$2y \geq 5x - 10$$

The grid may be used to graph the feasible region.



What is the maximum value for the objective function?

- [A] 8
- [B] 14
- [C] 22
- [D] 51

21. Which is the sum of  $A + B$ , given that

$$A = \begin{bmatrix} -9 & 2 & -3 \\ 1 & 5 & 8 \end{bmatrix}, \quad B = \begin{bmatrix} -5 & 4 & 0 \\ -4 & -3 & -7 \end{bmatrix}?$$

[A]  $\begin{bmatrix} -14 & 6 & -3 \\ -3 & 2 & 1 \end{bmatrix}$

[B]  $\begin{bmatrix} -14 & 6 & -3 \\ -3 & 2 & -1 \end{bmatrix}$

[C]  $\begin{bmatrix} -4 & 6 & -3 \\ -3 & -8 & -1 \end{bmatrix}$

[D]  $\begin{bmatrix} 14 & 6 & 3 \\ 5 & 8 & 15 \end{bmatrix}$

22. Given  $A = \begin{bmatrix} 0 & 2 & 1 \\ -5 & -1 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -4 \\ 0 & 1 \\ 5 & -1 \end{bmatrix}$ ,

find the product  $AB$ .

[A]  $\begin{bmatrix} 0 & -8 \\ -5 & 1 \end{bmatrix}$

[B]  $\begin{bmatrix} 5 & 1 \\ -5 & 19 \end{bmatrix}$

[C]  $\begin{bmatrix} 7 & -3 \\ -1 & 22 \end{bmatrix}$

[D] not possible

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23. A school fundraiser sells different sizes of gift baskets with a varying assortment of books and pencils. A *basic* basket contains 3 books and 4 pencils. A *big* basket contains 7 books and 8 pencils. Books cost \$5, and pencils cost \$2.

Which of the following shows the use of matrices to find the total cost for each size of basket?

[A] 
$$\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 4 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} 26 \\ 54 \end{bmatrix}$$

[B] 
$$\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 4 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 5 \\ 2 \end{bmatrix} = \begin{bmatrix} 23 \\ 51 \end{bmatrix}$$

[C] 
$$\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 7 \\ 4 & 8 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} 36 \\ 48 \end{bmatrix}$$

[D] 
$$\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 7 \\ 4 & 8 \end{bmatrix} \begin{bmatrix} 5 \\ 2 \end{bmatrix} = \begin{bmatrix} 29 \\ 36 \end{bmatrix}$$

24. Calculate the determinant of the matrix

$$\begin{vmatrix} 2 & -3 & 0 \\ 4 & 1 & 3 \\ 0 & 5 & 2 \end{vmatrix}$$

- [A] -50  
[B] -30  
[C] -2  
[D] 0

25. The inverse of the coefficient matrix is given. Use the inverse to solve the linear system.

$$3x + y + 4z = -4$$

$$-2x - 3z = 0$$

$$4x + y + 6z = 5$$

$$A^{-1} = \begin{bmatrix} 3 & -2 & -3 \\ 0 & 2 & 1 \\ -2 & 1 & 2 \end{bmatrix}$$

Which of the following is the  $z$ -coordinate for the solution to the system?

- [A] -27  
[B] 0  
[C] 5  
[D] 18

26. Solve the equation  $x^2 - 18x + 81 = 0$  by factoring.

- [A]  $x = \pm 9$   
[B]  $x = -9$   
[C]  $x = 9$   
[D] no solution

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27. Rewrite the equation  $y = x^2 + 4x + 3$  in vertex form.

[A]  $y = (x + 2)^2 - 1$

[B]  $y = (x + 2)^2 + 7$

[C]  $y = (x + 4)^2 - 13$

[D]  $y = (x + 4)^2 + 17$

28. Which are solutions for  $(6x + 4)^2 = 77$ ?

[A]  $\frac{4 - \sqrt{77}}{12}, \frac{4 + \sqrt{77}}{12}$

[B]  $\frac{4 - \sqrt{77}}{6}, \frac{4 + \sqrt{77}}{6}$

[C]  $\frac{-4 - \sqrt{77}}{6}, \frac{-4 + \sqrt{77}}{6}$

[D]  $\frac{-4 - \sqrt{77}}{12}, \frac{-4 + \sqrt{77}}{12}$

29. Which are solutions for  $x^2 + 6x - 40 = 0$  when solved by completing the square?

[A] 10, 4

[B] 10, -4

[C] -10, -4

[D] -10, 4

30. Which of the following shows the solution for  $2x^2 + 7x + 1 = 0$  using the quadratic formula?

[A]  $\frac{-7 + \sqrt{41}}{4}, \frac{-7 - \sqrt{41}}{4}$

[B]  $\frac{7 + \sqrt{41}}{4}, \frac{7 - \sqrt{41}}{4}$

[C]  $\frac{7 + \sqrt{57}}{4}, \frac{7 - \sqrt{57}}{4}$

[D]  $\frac{-7 + \sqrt{57}}{4}, \frac{-7 - \sqrt{57}}{4}$

31. Write the expression  $\frac{7 + 3i}{3 + 9i}$  as a complex number in standard form.

[A]  $\frac{1}{12} - \frac{3}{4}i$

[B]  $\frac{8}{15} - \frac{3}{5}i$

[C]  $\frac{8}{15} + \frac{4}{5}i$

[D]  $\frac{1}{12} + 1i$

32. Use the discriminant to determine the number and type of solutions of the equation  $9x^2 - 30x + 25 = 0$ .

[A] 1 real solution, 1 imaginary solution

[B] no real solutions, 2 imaginary solutions

[C] 1 real solution, no imaginary solution

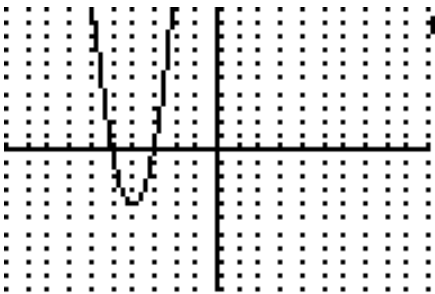
[D] 2 real solutions

33. Which graph from a graphing calculator represents the function  $y = -4(x^2 + 8x + 15)$ ?

[A]



[B]



[C]

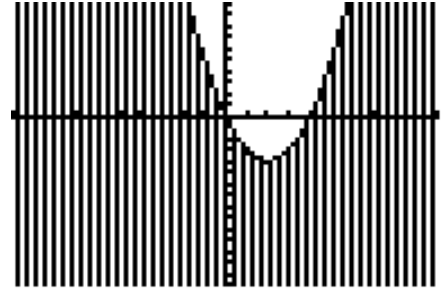


[D]

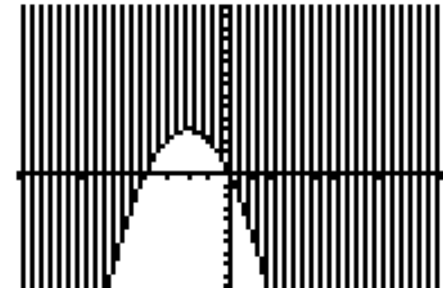


34. Which of the following graphs from a graphing calculator represents the graph of  $y \leq x^2 - 4x$ ?

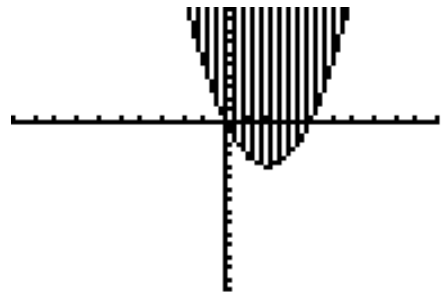
[A]



[B]



[C]



[D]

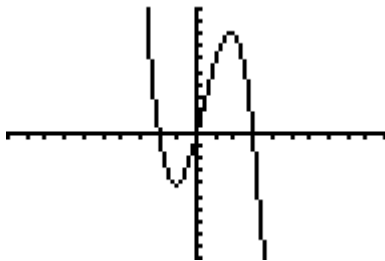


35. Which graph represents the factored function  $f(x) = x(x-3)(x+2)$ ?

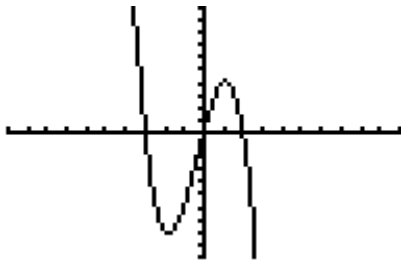
[A]



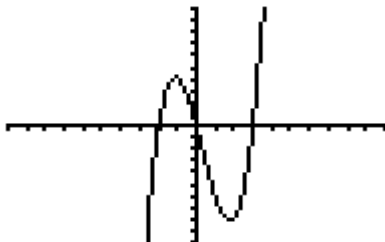
[B]



[C]



[D]



36. Evaluate  $f(-1)$  for the function  $f(x) = 3x^4 - 2x^3 + 7x - 4$ .

[A]  $f(-1) = -16$

[B]  $f(-1) = -6$

[C]  $f(-1) = 4$

[D]  $f(-1) = 8$

37. Solve the quadratic equation  $3x^2 + 5x = -4$ .

[A]  $\frac{5+i\sqrt{23}}{6}, \frac{5-i\sqrt{23}}{6}$

[B]  $\frac{5+i\sqrt{73}}{6}, \frac{5-i\sqrt{73}}{6}$

[C]  $\frac{-5+i\sqrt{23}}{6}, \frac{-5-i\sqrt{23}}{6}$

[D]  $\frac{-5+i\sqrt{73}}{6}, \frac{-5-i\sqrt{73}}{6}$

38. Multiply the following polynomials.

$$(x+4)(x^2+x+4)$$

[A]  $x^3 + x^2 + 16$

[B]  $x^3 + 5x^2 + 8x + 16$

[C]  $x^3 + 3x^2 + 8x + 16$

[D]  $x^3 + 5x^2 + 16$

Algebra II Practice Semester Exam

39. Factor the polynomial  $x^4 - 8x^2 - 9$  completely.

[A]  $(x-1)(x+1)(x^2+9)$

[B]  $x^2(x^2-8)-9$

[C]  $(x-3)(x+3)(x^2+1)$

[D]  $(x^2-3)(x^2+3)$

40. Which of the following represents the solution set of the polynomial equation below?

$$4x^3 - 8x^2 - x + 2 = 0$$

[A]  $\left\{-\frac{1}{2}, \frac{1}{2}, 2\right\}$

[B]  $\left\{-1, \frac{1}{2}, 2\right\}$

[C]  $\{0, 1, 2\}$

[D]  $\left\{-2, \frac{1}{2}, 2\right\}$

41. Which lists the set of all rational zeros of the polynomial function below?

$$f(x) = 2x^3 - 6x^2 + 8x - 24$$

[A]  $\{3\}$

[B]  $\{3, 8\}$

[C]  $\{1, 8\}$

[D]  $\{2, 3, 4, 8\}$

42. According to the rational zero theorem, which of the following would be tested as a *possible* rational zero for the function below?

$$f(x) = 4x^3 + ax^2 - 8x + 9$$

[A] 2

[B]  $\frac{2}{3}$

[C]  $-\frac{4}{9}$

[D]  $-\frac{1}{4}$

43. State the end behavior of the graph of  $f(x) = -x^3 + 7x + 4$  as  $x \rightarrow -\infty$ .

[A]  $f(x) \rightarrow +\infty$

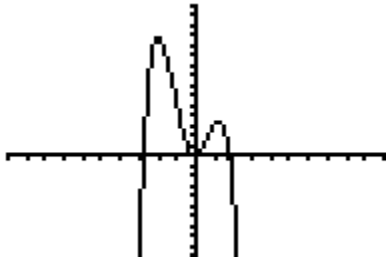
[B]  $f(x) \rightarrow 4$

[C]  $f(x) \rightarrow -\infty$

[D]  $f(x) \rightarrow 0$

44. Which best represents the sketch of the polynomial function  $y = x^4 - x^3 - 5x^2$  ?

[A]



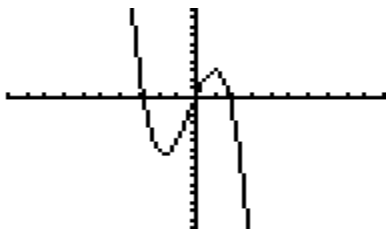
[B]



[C]



[D]



Algebra II  
Practice Semester Exam  
Answer Key

1-6 Free Response

1	D
2	C
3	B
4	D
5	A
6	C
7	B
8	D
9	C
10	B
11	B
12	C
13	A
14	A
15	B
16	D
17	B
18	B
19	B
20	D
21	A
22	B
23	B
24	C

25	A
26	C
27	A
28	C
29	D
30	A
31	B
32	C
33	D
34	A
35	D
36	B
37	C
38	C
39	C
40	A
41	A
42	D
43	A
44	B