

Applied Algebra II Final Exam
Specification Sheet

Free Response (Vocabulary, Knowledge, Concepts, Explanations)

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)

Multiple choice

1. Solve linear equation
2. Solve linear inequality
3. Solve compound inequality
4. Solve absolute value equation
5. Solve absolute value inequality
6. Solve radical equation
7. Solve quadratic equation using various methods
8. Solve higher degree equation
9. Solve system of linear equations
10. Solve system including non-linear equations (may include writing equations)
11. Solve system of equations (3 variables)
12. Find domain and range of relation
13. Evaluate a function
14. Inverse of a function/relation
15. Composition of functions
16. Graph – parabola
17. Graph – system of inequalities
18. Graph – higher order polynomial function
19. Graph – piecewise function
20. Write equation of a line
21. Solve literal equation
22. Find extrema of a polynomial function (maximum or minimum)
23. Sequence (arithmetic/geometric – n^{th} term)
24. Irrational number operations
25. Complex number operations
26. Matrix operations
27. Matrix application
28. Linear programming application

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4. Write the Rational Root Theorem.

Explain how the theorem can be used to solve higher order polynomial equations.

5. Write the Fundamental Theorem of Algebra.

Explain how the number of solutions of a polynomial function is related to the degree of the polynomial.

6. Write in word form the following mathematical statement.

$$\{(x, y) \mid x^2 + y^2 \leq 25; x, y \in \mathfrak{R}\}$$

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1. Which equation is equivalent to

$$\frac{7}{2}x - 1 = 2x + 5?$$

[A] $x = 2$

[B] $x = 3$

[C] $x = 4$

[D] $x = 6$

2. Which inequality is equivalent to

$$-n + 6 < 7n + 4?$$

[A] $n < \frac{1}{4}$

[B] $n < 4$

[C] $n > \frac{1}{4}$

[D] $n > 4$

3. Solve the inequality $3 < 2x + 11 < 17$.

[A] $-8 < x < 6$

[B] $-4 < x < 3$

[C] $7 < x < 14$

[D] $14 < x < 28$

4. Solve for values of x which make the following equation true.

$$|5x + 11| = 9$$

[A] $x = -\frac{2}{5}, -4$

[B] $x = -\frac{2}{5}$

[C] $x = \frac{8}{5}, 4$

[D] no solution

5. Which inequality is equivalent to

$$|x + 1| < 3.$$

[A] $-4 \leq x \leq 2$

[B] $x \leq -4$ or $x \geq 2$

[C] $-4 < x < 2$

[D] $x < -4$ or $x > 2$

6. Solve the equation $\sqrt[3]{x - 5} = -5$.

[A] -120

[B] $-120, 130$

[C] 130

[D] no solution

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7. Which is the solution set for the quadratic equation $x^2 + 5x + 1 = 0$?

[A] $\frac{-5 + \sqrt{21}}{2}, \frac{-5 - \sqrt{21}}{2}$

[B] $\frac{-5 + \sqrt{29}}{2}, \frac{-5 - \sqrt{29}}{2}$

[C] $\frac{5 + \sqrt{21}}{2}, \frac{5 - \sqrt{21}}{2}$

[D] $\frac{5 + \sqrt{29}}{2}, \frac{5 - \sqrt{29}}{2}$

8. Find all the zeros of the polynomial function

$$f(x) = x^3 + x^2 - 49x - 49.$$

[A] $\{-49, 1, -1\}$

[B] $\{-7, 7, -1\}$

[C] $\{-7, 1, -1\}$

[D] $\{-49, 1, -1\}$

9. Solve the system of linear equations for the value of x .

$$3x - 4y = 13$$

$$x + y = -5$$

[A] 0

[B] -1

[C] -4

[D] no solution

10. If the diagonal of a rectangle with perimeter 92 inches is 34 inches, find the length of the shortest side of the rectangle.

A] 8 inches

[B] 15 inches

[C] 16 inches

[D] 30 inches

11. Which ordered triple is a solution of the following linear system?

$$2x + 3y - z = 4$$

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

$$3x + y - z = 5$$

A] $(-1, 0, 2)$

[B] $(1, 0, -2)$

[C] $(1, 0, 2)$

[D] $(2, 0, -1)$

12. What is the domain of $g(x)$ in the function

$$g(x) = \sqrt{x+1}?$$

[A] $\{(x) | x \leq 1; x \in \mathfrak{R}\}$

[B] $\{(x) | x \leq -1; x \in \mathfrak{R}\}$

[C] $\{(x) | x \geq 1; x \in \mathfrak{R}\}$

[D] $\{(x) | x \geq -1; x \in \mathfrak{R}\}$

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13. Evaluate $f(2)$ for the function
 $f(x) = 9x^3 - x^2 + 2$.

[A] $f(2) = 18$

[B] $f(2) = 52$

[C] $f(2) = 70$

[D] $f(2) = 78$

14. Which of the following is the inverse of the relation $y = 5x^2 - 2$?

[A] $y = \pm 5\sqrt{x+2}$

[B] $y = \pm \sqrt{\frac{x+2}{5}}$

[C] $y = \pm \sqrt{\frac{5}{x+2}}$

[D] $y = \pm \frac{1}{5x^2 - 2}$

15. Let $f(x) = 9 - x^2$ and $g(x) = 3 - x$. Find the composite function $f(g(x))$.

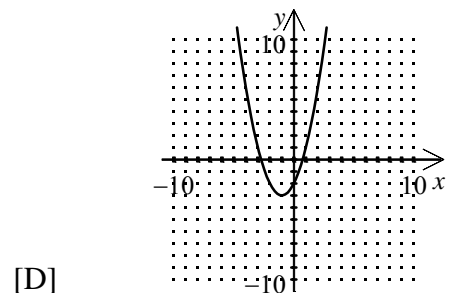
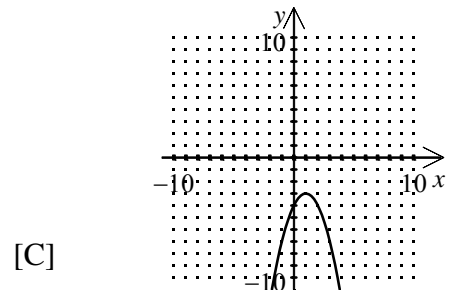
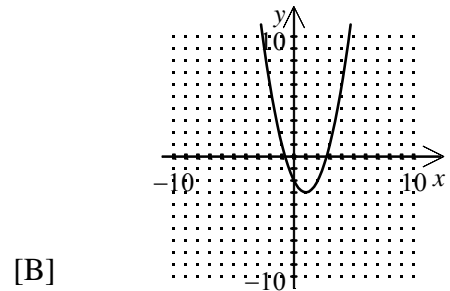
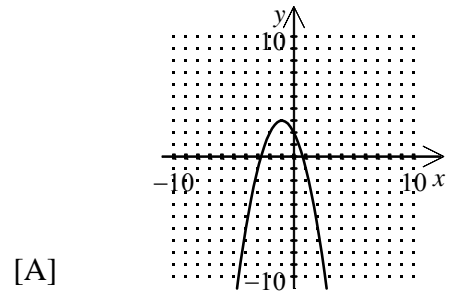
[A] $f(g(x)) = 3 + x$

[B] $f(g(x)) = -x^2 - x + 12$

[C] $f(g(x)) = x^3 - 3x^2 - 9x + 27$

[D] $f(g(x)) = -x^2 + 6x$

16. Graph the parabola $y = (x-1)^2 - 3$.

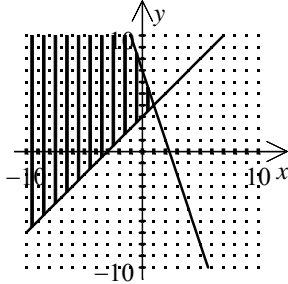


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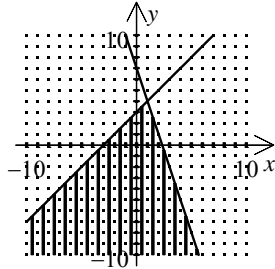
17. Determine the solution to the system of inequalities:

$$y \geq x + 3$$

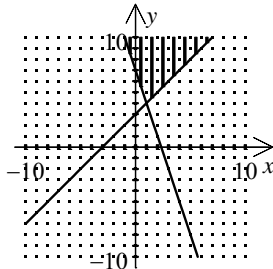
$$3x + y \leq 7$$



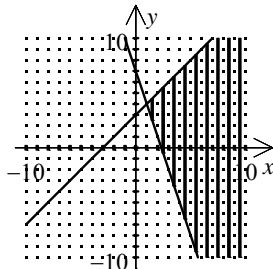
[A]



[B]

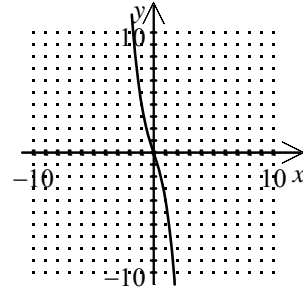


[C]

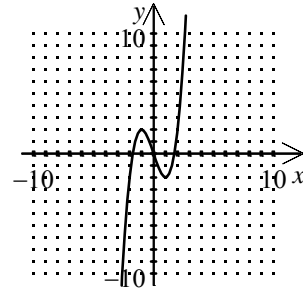


[D]

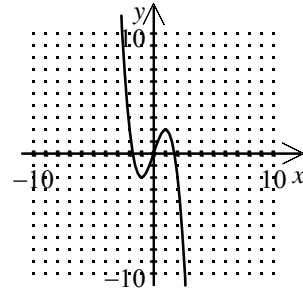
18. Graph $f(x) = x^3 - 3x$.



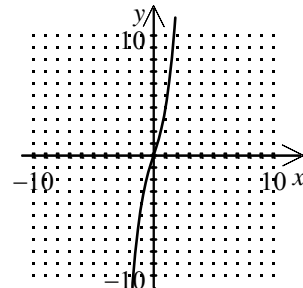
[A]



[B]



[C]

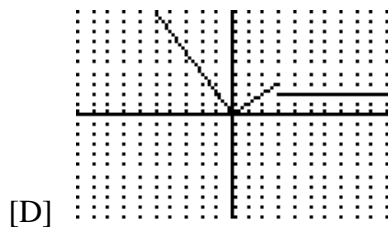
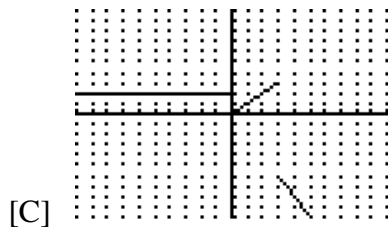
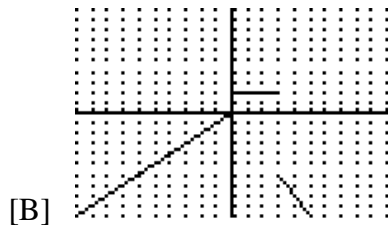
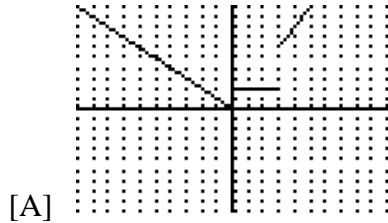


[D]

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19. Which sketch from a graphing calculator most closely represents the piecewise function below?

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



20. Write an equation of the line that passes through the points $(-4, -1)$ and $(2, 5)$.

[A] $y = \frac{3}{2}x + 1$

[B] $y = x + 3$

[C] $y = \frac{2}{3}x - 5$

[D] $y = -\frac{2}{3}x - \frac{11}{3}$

21. Solve for b_1 in the formula $A = \frac{1}{2}h(b_1 + b_2)$.

[A] $b_1 = A - \frac{1}{2}h - b_2$

[B] $b_1 = \frac{2A}{h} - b_2$

[C] $b_1 = \frac{(A - \frac{1}{2}h)}{b_2}$

[D] $b_1 = \frac{A}{2h} - b_2$

22. Find the maximum value of the quadratic equation $y = -2x^2 + 8x - 1$.

[A] $\text{max} = -23$

[B] $\text{max} = -1$

[C] $\text{max} = 2$

[D] $\text{max} = 7$

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23. What is the 4th term of a geometric sequence if the first term is 3, and the common ratio is 4?

[A] 15

[B] 36

[C] 108

[D] 192

24. Which of the following irrational numbers is the same as $\frac{4}{5+\sqrt{2}}$?

[A] $\frac{20+4\sqrt{2}}{27}$

[B] $\frac{20-4\sqrt{2}}{23}$

[C] $\frac{16\sqrt{2}}{23}$

[D] $\frac{4\sqrt{2}}{7}$

25. Write the expression $(2+3i)(1-4i)$ as a complex number in standard form.

[A] $2-10i$

[B] $2+12i$

[C] $3-i$

[D] $14-5i$

26. Calculate the determinant of the matrix

$$\begin{vmatrix} 1 & 4 & 0 \\ 3 & 8 & 3 \\ 0 & 2 & 1 \end{vmatrix}.$$

[A] -40

[B] -10

[C] 40

[D] 44

27. A school fundraiser sells different sizes of gift baskets with a varying assortment of meat and cheese. A basic basket contains 3 cheeses and 4 meats. A big basket contains 5 cheeses and 7 meats. Cheese costs the school \$4, and meat costs \$8.

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

[A] $\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 4 \\ 8 \end{bmatrix} = \begin{bmatrix} 44 \\ 76 \end{bmatrix}$

[B] $\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 5 \\ 4 & 7 \end{bmatrix} \begin{bmatrix} 4 \\ 8 \end{bmatrix} = \begin{bmatrix} 52 \\ 72 \end{bmatrix}$

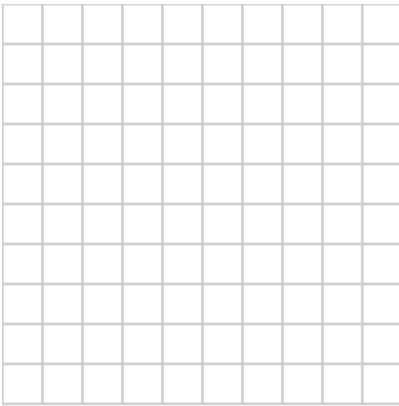
[C] $\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 5 & 7 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 8 \\ 4 \end{bmatrix} = \begin{bmatrix} 68 \\ 40 \end{bmatrix}$

[D] $\begin{matrix} \text{basic} \\ \text{big} \end{matrix} \begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 8 \\ 4 \end{bmatrix} = \begin{bmatrix} 40 \\ 68 \end{bmatrix}$

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28. You are making hand made jewelry to sell at an art fair. It takes you 2 hours to make a bracelet and 3 hours to make a necklace. You make a profit of \$10 for a bracelet and \$20 for a necklace. If you have no more than 30 hours available to make the jewelry and want to sell at least 12 pieces of jewelry how many bracelets should you make to maximize your profit?

The grid may help graph the feasible region using linear programming procedures.



- A] 6 bracelets
- [B] 10 bracelets
- [C] 15 bracelets
- [D] 0 bracelets

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Answer Key

1-6 Free Response

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