Algebra 2 Midterm Review
Answer Section

SHORT ANSWER

1. ANS:
$4-3i$
$3i+4$ $= 4+(3)i$ Rewrite as $a+bi$.

$= 4-(3)i$ Find $a-bi$.

$= 4-3i$ Simplify.

PTS: 1 DIF: Basic REF: 158353a2-4683-11df-9c7d-001185f0d2ea
OBJ: 2-5.5 Finding Complex Conjugates NAT: NT.CCSS.MTH.10.9-12.N.CN.3
TOP: 2-5 Complex Numbers and Roots KEY: complex numbers
DOK: DOK 3

2. ANS:
$6x^2+12x+29+\frac{50}{(x-2)}$

To divide, first write the dividend in standard form. Include missing terms with a coefficient of 0.
$6x^3+0x^2+5x-8$

Then write out in long division form, and divide.

$$\begin{array}{r} 6x^2+12x+29 \\ x-2\overline{)\,6x^3+0x^2+5x-8} \\ \underline{-(6x^3-12x^2)} \\ 12x^2+5x \\ \underline{-(12x^2-24x)} \\ 29x-8 \\ \underline{-(29x-58)} \\ 50 \end{array}$$

Write out the answer with the remainder to get $6x^2+12x+29+\frac{50}{(x-2)}$.

PTS: 1 DIF: Average REF: 15ea0026-4683-11df-9c7d-001185f0d2ea
OBJ: 3-3.1 Using Long Division to Divide Polynomials NAT: NT.CCSS.MTH.10.9-12.A.APR.6
STA: MACC.912.A-APR.4.6 TOP: 3-3 Dividing Polynomials
DOK: DOK 3

3. ANS:
quintic

PTS: 1 DIF: L2 REF: 5-1 Polynomial Functions
OBJ: 5-1.1 To classify polynomials STA: MA.912.A.2.5| MA.912.A.4.5
TOP: 5-1 Problem 1 Classifying Polynomials
KEY: degree of a polynomial | polynomial function | standard form of a polynomial function
DOK: DOK 1

4. ANS:
quadratic function
quadratic term: $-15x^2$
linear term: $1x$
constant term: 6

PTS: 1 DIF: L2 REF: 5-1 Modeling Data With Quadratic Functions
OBJ: 5-1.1 Quadratic Functions and Their Graphs
NAT: NAEP A2e | NAEP A2g | CAT5.LV21/22.50 | CAT5.LV21/22.53 | CAT5.LV21/22.54 | IT.LV17/18.AM | IT.LV17/18.DI | S9.TSK3.DSP | S9.TSK3.PRA | S10.TSK3.DSP | S10.TSK3.PRA | TV.LV21/22.14 | TV.LV21/22.16 | TV.LVALG.56 | TV.LVALG.57 | ADP I.4.2 | ADP J.4.5 | ADP J.5.3
TOP: 5-1 Example 1
KEY: quadratic function | quadratic term | linear term | constant term

5. ANS:
$2y^2(5y^2 + 16y - 5)$

$10y^4 + 32y^3 - 10y^2$	Find the GCF. The GCF of $10y^4$, $32y^3$, and $-10y^2$ is $2y^2$.
$2y^2(5y^2) + 2y^2(16y) - 2y^2(5)$	Write the terms as products using the GCF.
$2y^2(5y^2 + 16y - 5)$	Use the Distributive Property to factor out the GCF.

PTS: 1 DIF: Average REF: 11da5466-4683-11df-9c7d-001185f0d2ea
OBJ: 7-2.1 Factoring by Using the GCF NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MACC.912.A-SSE.1.2 TOP: 7-2 Factoring by GCF
DOK: DOK 2

6. ANS:
$(14x^2 + 13)(3x - 5)$
Group the monomials to find the GCF (greatest common factor), factor the GCF of each binomial, and then use the Distributive Property to obtain the factors.

PTS: 1 DIF: Average REF: Lesson 6-5
OBJ: 6-5.2 Factor polynomials by grouping. STA: MA.912.A.4.3
TOP: Factor polynomials by grouping. KEY: Polynomials | Factor Polynomials

7. ANS:
$x^2 + 5x - 6 = 0$
A quadratic equation with roots p and q can be written as $(x - p)(x - q) = 0$, which can be further simplified.

PTS: 1 DIF: Average REF: Lesson 5-3
OBJ: 5-3.1 Write quadratic equations in intercept form. STA: MA.912.A.4.3 | MA.912.A.10.3
TOP: Write quadratic equations in intercept form.
KEY: Quadratic Equations | Roots of Quadratic Equations

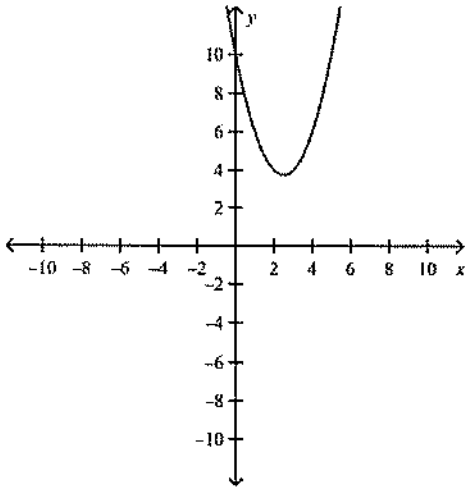
8. ANS:
$-18x^2 - 32x + 28$
Group the similar terms and then combine them.

PTS: 1 DIF: Average REF: Lesson 6-1 OBJ: 6-1.5 Subtract polynomials.
STA: MA.912.A.4.2 TOP: Subtract polynomials.
KEY: Polynomials | Subtract Polynomials

9. ANS:
$-21x^2y^4 + 14x^2y^2 - 84xy^3$
Use the Distributive Property and then multiply the monomials using the Product of Powers Property.

PTS: 1 DIF: Average REF: Lesson 6-1 OBJ: 6-1.6 Multiply polynomials.
STA: MA.912.A.4.2 TOP: Multiply polynomials.
KEY: Polynomials | Multiply Polynomials

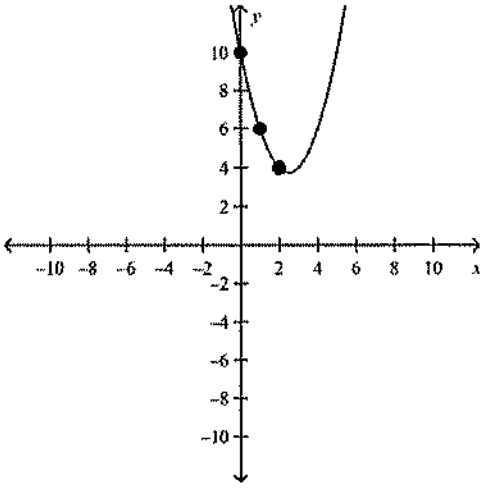
10. ANS:



Make a table.

x	$f(x) = x^2 - 5x + 10$	$(x, f(x))$
-2	$f(x) = (-2)^2 - 5(-2) + 10$	$(-2, 24)$
-1	$f(x) = (-1)^2 - 5(-1) + 10$	$(-1, 16)$
0	$f(x) = 0^2 - 5(0) + 10$	$(0, 10)$
1	$f(x) = 1^2 - 5(1) + 10$	$(1, 6)$
2	$f(x) = 2^2 - 5(2) + 10$	$(2, 4)$

Plot the ordered pairs and connect with a smooth curve.



PTS: 1 DIF: Average REF: 155f903e-4683-11df-9c7d-001185f0d2ea
OBJ: 2-1.1 Graphing Quadratic Functions Using a Table
TOP: 2-1 Using Transformations to Graph Quadratic Functions
KEY: quadratic | graph DOK: DOK 3

11. ANS:

$\{-\frac{3}{2}, -1\}$

For any real numbers a and b, if $ab = 0$, then either $a = 0$, $b = 0$, or both a and b are equal to zero.

PTS: 1 DIF: Average REF: Lesson 5-3
OBJ: 5-3.2 Solve quadratic equations by factoring. STA: MA.912.A.4.3 | MA.912.A.10.3
TOP: Solve quadratic equations by factoring.
KEY: Quadratic Equations | Solve Quadratic Equations | Factoring

12. ANS:
{−8, 6}
For any real numbers a and b, if $ab = 0$, then either $a = 0$, $b - 0$, or both a and b are equal to zero.

PTS: 1 DIF: Average REF: Lesson 5-3
OBJ: 5-3.2 Solve quadratic equations by factoring. STA: MA.912.A.4.3 | MA.912.A.10.3
TOP: Solve quadratic equations by factoring.
KEY: Quadratic Equations | Solve Quadratic Equations | Factoring

13. ANS:
{−3, 6}
To complete the square for any quadratic expression of the form $x^2 + bx$, find half of b, and square the result. Then, add the result to $x^2 + bx$.

PTS: 1 DIF: Average REF: Lesson 5-5
OBJ: 5-5.2 Solve quadratic equations by completing the square.
STA: MA.912.A.7.3 | MA.912.A.7.5 TOP: Solve quadratic equations by completing the square.
KEY: Quadratic Equations | Solve Quadratic Equations | Completing the Square

14. ANS:
The discriminant is 148. Because the discriminant is greater than 0 and is not a perfect square, the two roots are real and irrational.
If $b^2 - 4ac > 0$ and $b^2 - 4ac$ is a perfect square, then the roots are rational.
If $b^2 - 4ac > 0$ and $b^2 - 4ac$ is not a perfect square, then the roots are real and irrational.

PTS: 1 DIF: Basic REF: Lesson 5-6
OBJ: 5-6.2 Use the discriminant to determine the number and types of roots of a quadratic equation.
STA: MA.912.A.7.4 | MA.912.A.7.5 | MA.912.A.10.3
TOP: Use the discriminant to determine the number and types of roots of a quadratic equation.
KEY: Quadratic Equations | Roots of Quadratic Equations | Discriminates

15. ANS:
$120 - 40i$
Use the FOIL method to multiply the complex numbers and use the formula $i^2 = -1$. Combine the real parts and then the imaginary parts of the two numbers.

PTS: 1 DIF: Average REF: Lesson 5-4
OBJ: 5-4.4 Perform multiplication operations with complex numbers.
STA: MA.912.A.1.6 TOP: Perform multiplication operations with complex numbers.
KEY: Complex Numbers | Multiply Complex Numbers

16. ANS:
$16 - 9i$
Combine the real and imaginary parts of the complex numbers to add them.

PTS: 1 DIF: Average REF: Lesson 5-4
OBJ: 5-4.3 Perform addition and subtraction operations with complex numbers.
STA: MA.912.A.1.6
TOP: Perform addition and subtraction operations with complex numbers.
KEY: Complex Numbers | Add Complex Numbers | Subtract Complex Numbers

17. ANS:
$\frac{60}{221} - \frac{66}{221}i$
Multiply the numerator as well as the denominator by the conjugate of the denominator. Use the FOIL method and the difference of squares to simplify the given expression.

PTS: 1 DIF: Average REF: Lesson 5-4
OBJ: 5-4.5 Perform division operations with complex numbers.
STA: MA.912.A.1.6 TOP: Perform division operations with complex numbers.
KEY: Complex Numbers | Divide Complex Numbers

18. ANS:
$(x+4)(x-5)(x+5)$

$(x^3+4x^2)+(-25x-100)$	Group terms.
$=x^2(x+4)-25(x+4)$	Factor common monomials from each group.
$=(x+4)(x^2-25)$	Factor out the common binomial.
$=(x+4)(x-5)(x+5)$	Factor the difference of squares.

PTS: 1 DIF: Average REF: 15f1273a-4683-11df-9c7d-001185f0d2ea
OBJ: 3-4.2 Factoring by Grouping NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MACC.912.A-SSE.1.2 TOP: 3-4 Factoring Polynomials
DOK: DOK 3

19. ANS:
The equation has two real roots, 5 and –4.
Factor the equation and find the roots.

PTS: 1 DIF: Average REF: Lesson 6-7
OBJ: 6-7.1 Determine the number and types of roots for a polynomial equation.
STA: MA.912.A.4.6 | MA.912.A.4.8 | MA.912.A.4.3 | MA.912.A.4.7
TOP: Determine the number and types of roots for a polynomial equation.
KEY: Polynomial Equations | Roots | Real Roots

20. ANS:
$\left\{\frac{-11-\sqrt{157}}{-2}, \frac{-11+\sqrt{157}}{-2}\right\}$
The solution of a quadratic equation of the form $ax^2+bx+c=0$, where $a \neq 0$, is obtained by using the formula $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$.

PTS: 1 DIF: Average REF: Lesson 5-6
OBJ: 5-6.1 Solve quadratic equations by using the Quadratic Formula.
STA: MA.912.A.7.4 | MA.912.A.7.5 | MA.912.A.10.3
TOP: Solve quadratic equations by using the Quadratic Formula.
KEY: Quadratic Equations | Solve Quadratic Equations | Quadratic Formula

21. ANS:
$(x+1)(5x-4)$
Try factors of 5 for the coefficients and factors of –4 for the constant terms.
The combination that works is:
$(x+1)(5x-4) = 5x^2 - 4x + 5x - 4 = 5x^2 + x - 4$

PTS: 1 DIF: Basic REF: 11eb04ea-4683-11df-9c7d-001185f0d2ea
OBJ: 7-4.1 Factoring ax^2 + bx + c by Guess and Check NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MACC.912.A-SSE.1.2 TOP: 7-4 Factoring ax^2 + bx + c
KEY: factor | trinomial | guess and check DOK: DOK 2

22. ANS:
$y = 3(x+3)^2 - 5$

PTS: 1 DIF: L2 REF: 5-3 Translating Parabolas
OBJ: 5-3.1 Using Vertex Form
NAT: NAEP G2c | CAT5.LV21/22.54 | CAT5.LV21/22.56 | IT.LV17/18.AM | S9.TSK3.GM | S9.TSK3.PRA | S10.TSK3.GM | S10.TSK3.PRA | TV.LV21/22.14 | TV.LV21/22.16 | TV.LVALG.56 | TV.LVALG.57 | ADP J.4.5 | ADP J.5.3 | ADP K.6 TOP: 5-3 Example 2
KEY: parabola | equation of a parabola | vertex form

23. ANS:
$(x+5)(5x+3)$
Since $a = 5$, the coefficients of the **F**irst terms must be factors of 5.
Since $c = 15$, the **L**ast terms must be factors of 15.
Since $b = 28$, the **O**uter and **I**nner products must add up to 28.
The sum of the products of the outer and inner terms should be 28.
It may be helpful to make a table to check all the factors of 5 and all the factors of 15. Then check the products of the outer and inner terms to see if the sum is 28.

PTS: 1 DIF: Basic REF: 11ed6746-4683-11df-9c7d-001185f0d2ea
OBJ: 7-4.2 Factoring ax^2 + bx + c When c Is Positive NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MACC.912.A-SSE.1.2 TOP: 7-4 Factoring ax^2 + bx + c
DOK: DOK 2

24. ANS:
The function has a minimum value. The minimum value of the function is –6.
The y-coordinate of the vertex of a quadratic function is the maximum or minimum value obtained by the function.

PTS: 1 DIF: Average REF: Lesson 5-1
OBJ: 5-1.2 Find and interpret the maximum and minimum values of a quadratic function.
STA: MA.912.A.2.6 | MA.912.A.7.6 | MA.912.A.10.3
TOP: Find and interpret the maximum and minimum values of a quadratic function.
KEY: Maximum Values | Minimum Values | Quadratic Functions

25. ANS:
quotient $8x - 1$ and remainder 0
Use the division algorithm. When dividing, you can add or subtract only similar terms.

PTS: 1 DIF: Advanced REF: Lesson 6-2
OBJ: 6-2.1 Divide polynomials using long division. STA: MA.912.A.4.4
TOP: Divide polynomials using long division.
KEY: Polynomials | Divide Polynomials | Long Division

26. ANS:
$16i\sqrt{21}$

$8\sqrt{-84}$

$= 8\sqrt{(-1)(84)}$ Factor out -1.

$= 8\sqrt{-1}\sqrt{84}$ Product Property

$= 16\sqrt{21}\sqrt{-1}$ Simplify.

$= 16i\sqrt{21}$ Express in terms of i.

PTS: 1 DIF: Average REF: 157c2c8e-4683-11df-9c7d-001185f0d2ea
OBJ: 2-5.1 Simplifying Square Roots of Negative Numbers NAT: NT.CCSS.MTH.10.9-12.N.CN.1
TOP: 2-5 Complex Numbers and Roots KEY: complex numbers
DOK: DOK 2

27. ANS:
$5x^4 - 3x^3 - 25x^2 + 25x - 6$

$(5x - 3)(x^3 - 5x + 2)$

$= 5x(x^3 - 5x + 2) - 3(x^3 - 5x + 2)$ Distribute $5x$ and -3.

$= 5x(x^3) + 5x(-5x) + 5x(2) - 3(x^3) - 3(-5x) - 3(2)$ Distribute $5x$ and -3 again.

$= 5x^4 - 25x^2 + 10x - 3x^3 + 15x - 6$ Multiply.

$= 5x^4 - 3x^3 - 25x^2 + 25x - 6$ Combine like terms.

PTS: 1 DIF: Average REF: 15e2b202-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.2 Multiplying Polynomials NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MACC.912.A-APR.1.1 TOP: 3-2 Multiplying Polynomials
DOK: DOK 3

28. ANS:
8
Add the exponents of the variables. 3 + 5 = 8
The degree is 8.

PTS: 1 DIF: Basic REF: 15d6ed46-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.1 Identifying the Degree of a Monomial TOP: 3-1 Polynomials
DOK: DOK 2

29. ANS:

$-4x^2 + 22x - 25$

$h(x) - 2k(x)$

$= 2x^2 + 6x - 9 - 2(3x^2 - 8x + 8)$ Substitute the given values.

$= 2x^2 + 6x - 9 - 6x^2 + 16x - 16$ Distribute.

$= -4x^2 + 22x - 25$ Simplify.

PTS: 1 DIF: Advanced REF: 15e04fa6-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.A.APR.1 STA: MACC.912.A-APR.1.1
TOP: 3-1 Polynomials DOK: DOK 3

30. ANS:

$x = -20$ or $x = -3$

$h(x) = x^2 + 23x + 60$

$x^2 + 23x + 60 = 0$ Set the function equal to 0.

$(x + 20)(x + 3) = 0$ Factor: Find factors of 60 that add to 23.

$x + 20 = 0$ or $x + 3 = 0$ Apply the Zero-Product Property.

$x = -20$ or $x = -3$ Solve each equation.

PTS: 1 DIF: Basic REF: 157040c2-4683-11df-9c7d-001185f0d2ea
OBJ: 2-3.2 Finding Zeros by Factoring
NAT: NT.CCSS.MTH.10.9-12.A.REI.4 | NT.CCSS.MTH.10.9-12.F.IF.8
STA: MACC.912.A-REI.2.4
TOP: 2-3 Solving Quadratic Equations by Graphing and Factoring
KEY: solve quadratic equations DOK: DOK 3

31. ANS:

$(m+4)(m+6)$

$m^2 + 10m + 24$

$(m+ ?)(m+ ?)$ Look for the factors of 24 whose sum is 10.

$(m+4)(m+6)$ The factors are 4 and 6.

PTS: 1 DIF: Basic REF: 11e404e6-4683-11df-9c7d-001185f0d2ea
OBJ: 7-3.2 Factoring x^2 + bx + c When c Is Positive NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MACC.912.A-SSE.1.2 TOP: 7-3 Factoring x^2 + bx + c
DOK: DOK 2

32. ANS:

quotient $\left(2x^2 - 6x + 4\right)$ and remainder 0

To use synthetic division, the divisor must be of the form $x - r$.

PTS: 1 DIF: Advanced REF: Lesson 6-2
OBJ: 6-2.2 Divide polynomials using synthetic division. STA: MA.912.A.4.4
TOP: Divide polynomials using synthetic division.
KEY: Polynomials | Divide Polynomials | Synthetic Division

33) $(x - 2)(x^2 + 8)$

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

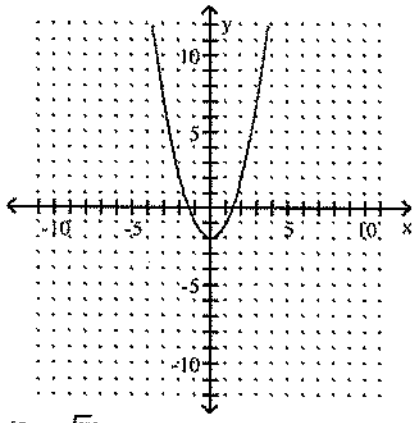
35) $(2x - 5)(4x^2 + 10x + 25)$

36) domain: $(-\infty, \infty)$
range: $[-1, \infty)$

37) $3x\sqrt{6y}$

38) Function

39) domain: $(-\infty, \infty)$; range: $(-2, \infty)$



40) $\{8 \pm \sqrt{7}\}$

41) 17

42) 181

43) $x^2 + 11x + 30$

44) $9x^2 - 12x + 4$

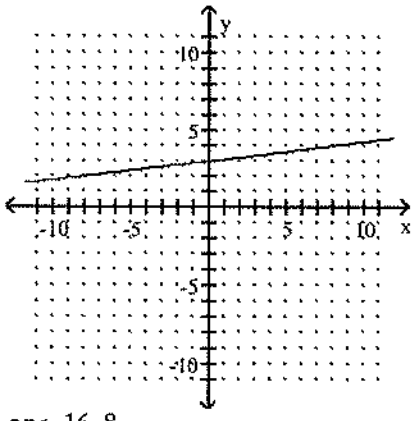
45) Domain: $(-\infty, \infty)$
Range: $[2, \infty)$

46) $\{7 \pm 4i\}$

47) $(5, -32)$

48) $-5x^4y^9$

49)

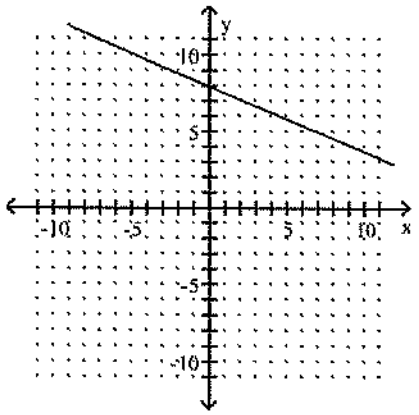


50) $\frac{256x^{16}y^8}{z^8}$

51) w^{18}

52) $-2x^7y^6$

53) 7
54) -9
55) domain = {-3, 7, 9}; range = {2, 6, -6, -7}
56) (5x + 9)(x + 3)
57) C
58) - 16
59) 1
60)



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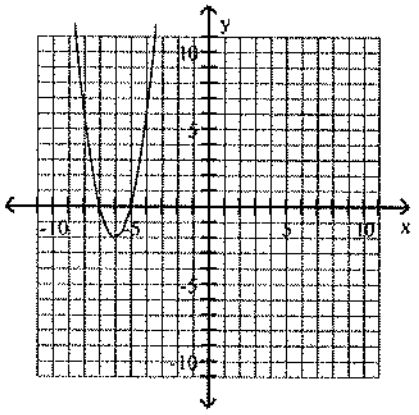
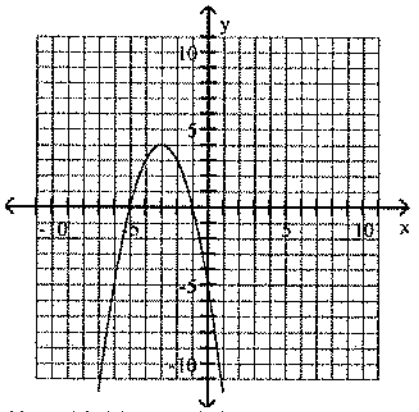
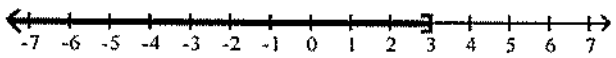


62)



63) (4x + 13y)(4x - 13y)
64) $\frac{1}{16p^2}$

65) $(-\infty, 3]$



66) $(-9, -8)$

67) minimum; $(1, -9)$

68) C

69) C

70) $3x^7 + 25x^6 - 18$

71) $x + 7 - \frac{5}{x + 3}$

72) 9; $x^2 - 6x + 9 = (x - 3)^2$

73) 8

74) $4x(x - 6)$

75) $(3, \infty)$