

Lecture Guide

Math 90 - Intermediate Algebra

to accompany

Intermediate Algebra, 3rd edition

Miller, O'Neill, & Hyde

Prepared by

Stephen Toner

Victor Valley College

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8.1 – Solving Quadratic Equations (That Won't Factor)

A. Square Root Each Side

1. Solve: $x^2 = 10$

2. Solve: $x^2 = 48$

3. Solve: $x^2 = -20$

4. Given the equation $x^2 = k$, match the following:

- | | |
|--------------------------|----------------------------------|
| a. If $k > 0$, then ___ | 1. There is 1 real solution |
| b. If $k < 0$, then ___ | 2. There are 2 real solutions |
| c. If $k = 0$, then ___ | 3. There are 2 complex solutions |

5. Solve: $(t + 5)^2 = -18$

6. Solve: $\left(x - \frac{3}{4}\right)^2 + \frac{7}{4} = 0$

7. Solve: $3(t - 1)^2 + 7 = 12$

B. Completing the Square:

1. Write your equation in the form:
2. If there's a leading coefficient, divide both sides by it.
3. Cut the number in front of x in half; write this new value on the line below.
4. Square this new value and write the product in the blank on the line above; add this product to the right side of the equation also.
5. Insert an x, parentheses and exponent on the left to complete the square.
6. Add together the values on the right side.
7. Square root each side of the equation. Don't forget the plus-or-minus sign!
8. Solve for x.

*Solve each by completing the square:

8. Solve: $m^2 + 6m + 8 = 0$

9. Solve: $p^2 + 4p + 6 = 0$

10. Solve: $-3y - 10 = -y^2$

11. Find the value of k in order to have a completed square:

a. $x^2 + 10x + k$

b. $x^2 + kx + 16$

12. Solve: $2a^2 + 4a + 5 = 0$

13. Solve: $a^2 + b^2 = c^2$ for b .

14. Solve: $V = \frac{1}{3}\pi r^2$ for r .

15. Solve: $5x^2 - 3x + 8 = 0$ by completing the square.

8.2 – The Quadratic Formula

1. Complete the square to solve for x:

$$ax^2 + bx + c = 0$$

2. Solve: $2t^2 + 3t - 7 = 0$

3. Solve: $\frac{2}{3}p^2 - \frac{1}{6}p + \frac{1}{2} = 0$

The expression $b^2 - 4ac$ under the radical of the quadratic formulas is called the _____.

Three cases:

If $b^2 - 4ac$ is negative,

If $b^2 - 4ac$ is zero,

If $b^2 - 4ac$ is positive,

4. Find the value of the discriminant. Use it to determine the nature of the solutions.

$$12y - 9 = 4y^2$$

5. The volume of a rectangular box is 64 ft^3 . If the width is 3 times the height, and the length is 9 times the height, find the dimensions of the box.

8.3 – Equations in Quadratic Form

1. Solve: $m^{2/3} - m^{1/3} - 6 = 0$

2. Solve: $2t^{2/5} + 7t^{1/5} + 3 = 0$

3. Solve: $y + 6\sqrt{y} = 16$

4. Solve: $16\left(\frac{x+6}{4}\right)^2 + 8\left(\frac{x+6}{4}\right) + 1 = 0$

5. Solve: $m^{1/2} - 2m^{1/4} - 24 = 0$

Sections 8.1 – 8.3 Review

1. Solve $x^2 = 8x$ in three different ways.

2. Solve: $y^{2/3} + 5y^{1/3} + 4 = 0$

3. Solve: $4x(x + 3) = 6(2x - 4)$

4. Solve: $2u(u - 3) = 4(2 - u)$

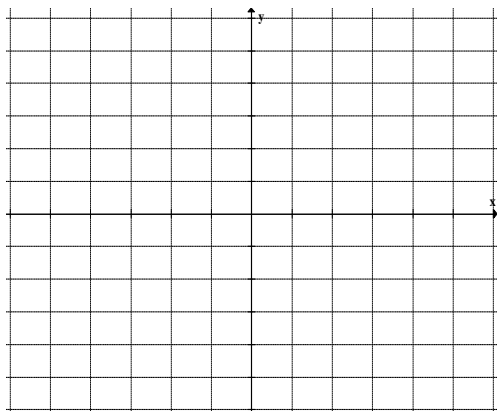
5. Solve: $a^4 - 10a^2 + 9 = 0$

6. Solve: $2\left(\frac{t-4}{3}\right)^2 - \left(\frac{t-4}{3}\right) - 3 = 0$

7. Solve: $x^{-2} - 2x^{-1} - 24 = 0$

8.4 & 8.5 – Graphing Parabolas

1. Base graph: $y = x^2$

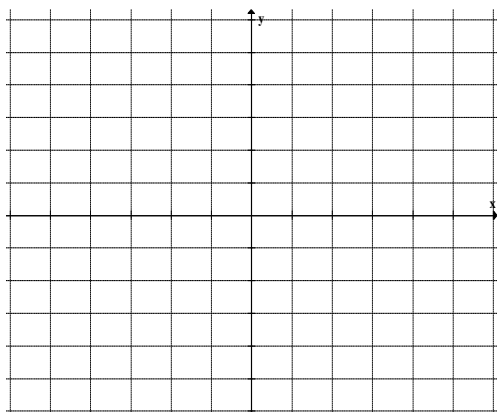


2. On the same axes, graph each of the following:

a. $y = 3x^2$

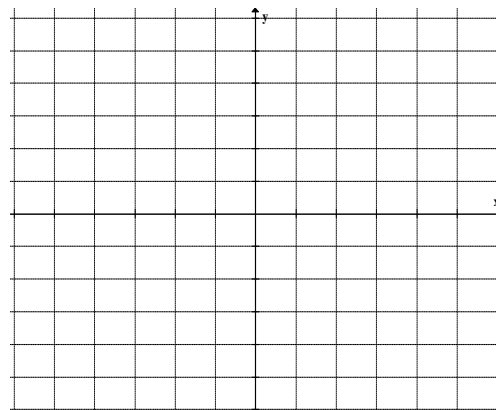
b. $y = \frac{1}{2}x^2$

c. $y = -2x^2$

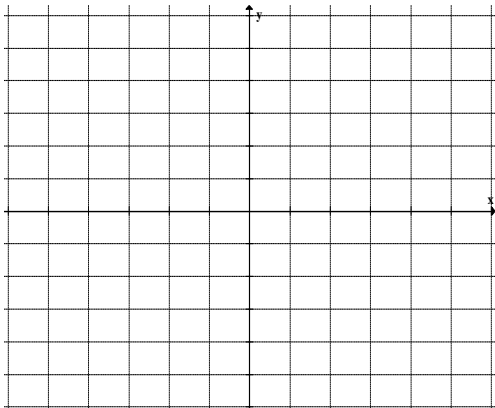


General Formula: $y = a(x - h)^2 + k$

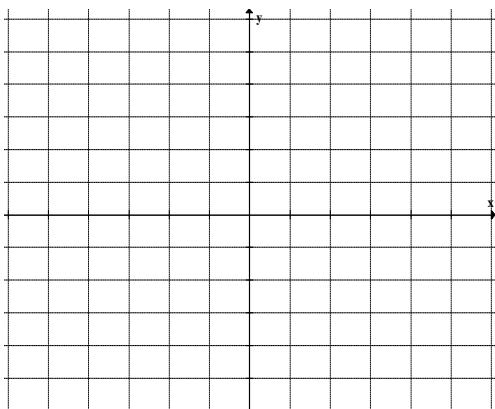
3. Graph: $y = (x + 3)^2 - 2$



4. Graph: $y = \frac{-1}{2}(x + 1)^2 + 2$

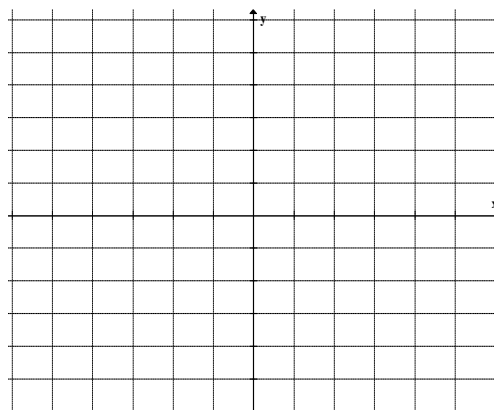


5. Graph: $y = 3(x - 1)^2 - 4$



6. Referring to the previous problem, find the x-intercepts of $y = 3(x - 1)^2 - 4$.

7. Graph: $y = \frac{2}{3}(x + 2)^2 + 1$



8. Find the vertex and the axis of symmetry.
Name two additional points on each side of the
vertex:

$$y = 2x^2 + 12x + 13$$

9. Find the vertex and the axis of symmetry.
Name two additional points on each side of the
vertex:

$$p(x) = -3x^2 + 6x - 5$$

10. Find the vertex and the axis of symmetry.
Name two additional points on each side of the
vertex:

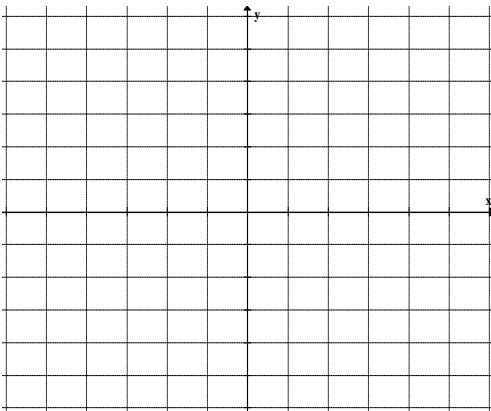
$$y = -\frac{2}{3}x^2 + 6x - \frac{7}{3}$$

11. Find the vertex and the axis of symmetry.
Name two additional points on each side of the vertex:

$$y = \frac{4}{5}x^2 + 16x - 8$$

12. Graph. Label the vertex and x-intercepts.

$$y = x^2 - 4x - 5$$



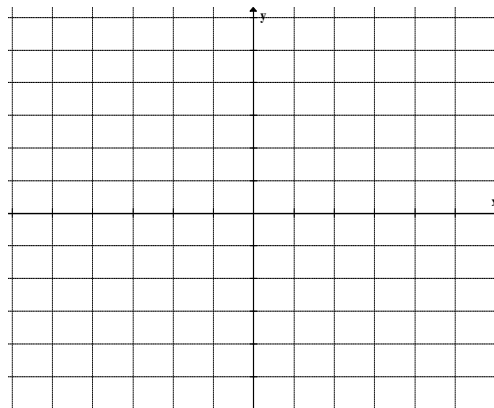
13. The cost C (in dollars) of manufacturing x dresses at Kala's Fashion Warehouse is given by the function $C(x) = 0.3x^2 - 90x + 25,136$. What is the minimum cost of manufacturing dresses? Do not round your answer.

14. A ball is thrown vertically upward. After t seconds, its height h (in feet) is given by the function $h(t) = 112t - 16t^2$. What is the maximum height that the ball will reach? Do not round your answer.

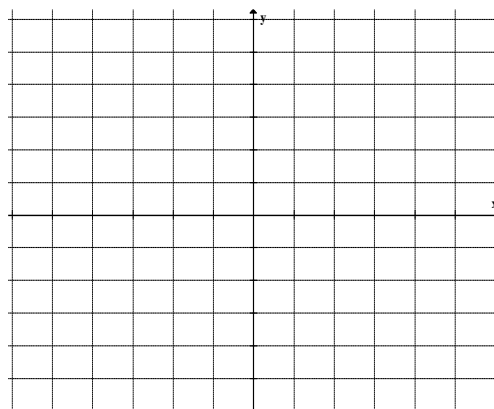
15. A farmer wishes to fence in a rectangular pen such that the side of his house serves as one side of the pen. If he has only 40 feet of fencing, what dimensions of the pen will produce the maximum area possible?

Review of sections 8.4-8.5:

1. Graph: $y = 2(x - 3)^2 - 1$



2. Graph: $y = \frac{-2}{3}(x + 1)^2 - 1$



3. Find the vertex of $y = \frac{2}{3}x^2 - 6x + 2$.

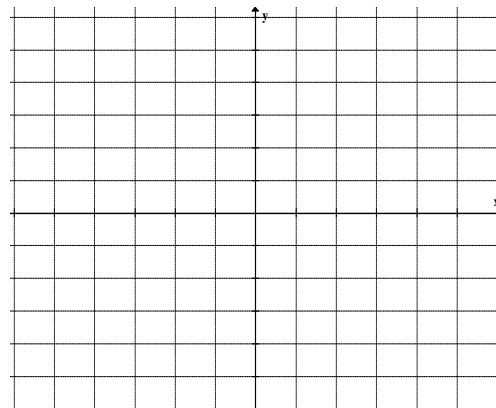
Also state two additional points on each side of the vertex.

4. Find the vertex of $y = \frac{-4}{3}x^2 - \frac{16}{3}x - \frac{19}{3}$.

Also state two additional points on each side of the vertex.

5. Graph $y = \frac{-1}{2}(x + 2)^2 + 1$. Also state two additional points on each side of the vertex.

Find the x-intercepts.



8.6 – Polynomial and Rational Inequalities

1. $(p - 4)(p + 2) > 0$

2. $-8(2t + 5)(6 - t) < 0$

3. $w^2(3 - w)(w + 2) \geq 0$

4. $\frac{a+2}{a-3} < 0$

5. $x^3 + 36 > 4x^2 + 9x$

6. $\frac{x-2}{x+6} \leq 5$

Chapter 8 Review

*Solve each quadratic equation:

1. $x^2 = -48$

2. $(x + 5)^2 + 8 = 19$

3. $x^2 + 10x + 7 = 0$ in two ways

4. $3x^2 + 15x - 2 = 0$

5. $\frac{1}{5}h^2 + h + \frac{3}{5} = 0$

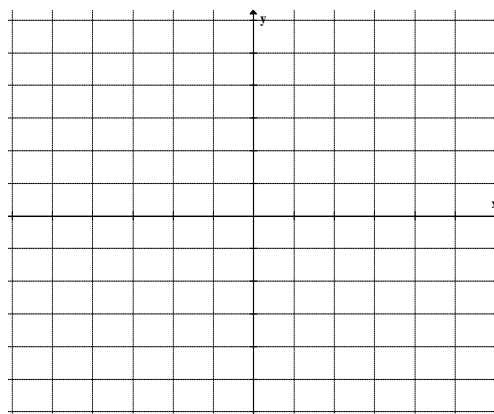
6. $x - 6\sqrt{x} + 8 = 0$

7. $x - 2\sqrt{x} - 15 = 0$

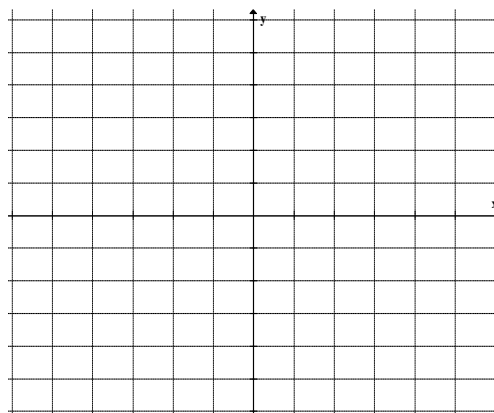
8. $2n^4 - n^2 - 3 = 0$

9. $x^{2/5} + x^{1/5} - 6 = 0$

10. Graph: $y = \frac{1}{5}(x - 3)^2 - 2$ and find its x-intercepts.



11. Graph: $y = (x + 2)^2 - 2$



12. Find the vertex of $y = 3x^2 + 2x - 7$ and two additional points on each side of the vertex.

13. Find the vertex of $y = \frac{4}{3}x^2 + \frac{5}{3}x - \frac{7}{3}$.

14. Solve: $(x - 3)(x + 4) \leq 0$

15. Solve: $(x - 2)^2(x + 1)(x - 5) > 0$

16. Solve: $\frac{x+5}{x-3} \geq 0$