

MA 107 INTERMEDIATE ALGEBRA
-A JUST IN TIME APPROACH-
PRACTICE TEST FOUR

Sections: 5.1, 5.2, 5.3, 5.4, 6.2, 6.3, 6.4,

In exercise 1, for what real numbers are the equations true? [5.1]

- 1a) $x^2 = -121$
- b) $y^2 = 0.0049$
- c) $a^2 = 196$



2. In the following exercise, simplify without using a calculator. [5.1]

- a) $\sqrt{27}$
- b) $\sqrt{12}$
- c) $\sqrt{0.0004}$
- d) $\frac{\sqrt{64}}{\sqrt{4}}$
- e) $\sqrt{1.21}$
- f) $\sqrt{900}$
- g) $\sqrt{0.25}$

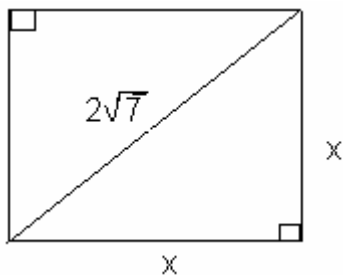


3. Evaluate the following without using a calculator. [5.1, 5.3]

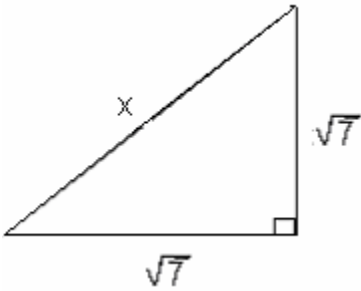
$$\frac{-7 \pm \sqrt{3^2 - 4 \times 1 \times -4}}{2 \times 3}$$

4. Solve the following for x. [5.1]

a.



b.



In exercise 5-8, solve by taking square roots. [5.2]

5. $4x^2 - 81 = 0$

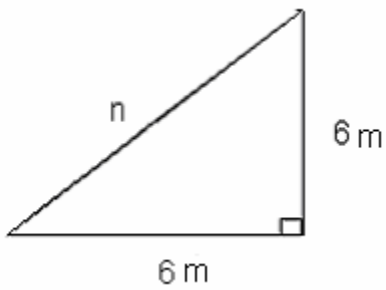
6. $4x^2 + 12x + 9 = 0$

7. $16x^2 - 64 = 0$

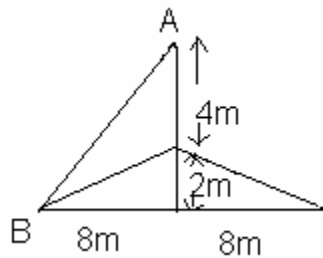
8. $0.04x^2 - 169 = 0$

9. Find the length of the hypotenuse and round answers to the nearest tenth. [5.1, 5.2]

a.



b. Find the distance from A to B.



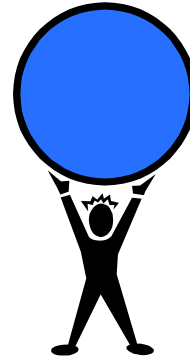
In exercise 10- 11, solve. Evaluate roots and round to the nearest tenth.
[5.2]

10) $9x^2 - 27 = 0$

11) $7x^2 - 14 = 0$

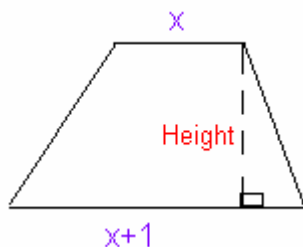
12. An approximation to the perimeter of an ellipse is

$$c = 2\pi\sqrt{\frac{a^2 + b^2}{2}} . \text{ Solve the formula for a. } [5.2]$$



13. **Solve for A** : $d = \sqrt{\frac{4A}{\pi}}$, where A is the area of a circle and d is the diameter. [5.2]

14. **Area of Trapezoid.** If the area of a trapezoid is $2x^2 + 5x + 2$ square meters and the two parallel sides are x meters and x+1 meters, then what polynomial represents the height of the trapezoid? [5.3]



15. **Economic Order Quality.** Purchasing managers use the formula

$$E = \sqrt{\frac{2AS}{I}}$$

to determine the most economic order quantity E for parts used in production. A is the quantity that the plant will use in one year. S is the cost of setup for making the part, and I is the cost of holding one unit in stock for one year. Find E if $S = 6000$, $A = 25$, and $I = \$140$. [5.2]



16 – 20. Use factoring to solve the equations. If there are real number solutions, indicate whether they are rational or irrational. Confirm your answers with a graphing calculator. [5.3]

16) $x^2 + 2x - 8 = 0$

17) $6x^2 - 7x + 2 = 0$

18) $(x - 3)(x + 4) = 30$

19) $12x^2 - 17x + 6 = 0$

20) $5x^2 + 3x = -3$



21. Multiply out the following expression. [5.3]

$$-3m(2m - 3n)^2$$

Complete the square on the equations 22-23. Identify the square of the binomial that you obtain on the left side. [5.3]

22) $x^2 - 4x + 1 = 0$

23) $4x^2 - 4x = 99$

24-25. Find the vertex for the graph of each equation. Round to three decimal places. [5.3]

24. $y := x^2 - x + 2$

25. $y := 4x^2 - 3x + 2$

26-27. Use factoring to find the x-intercepts, and then use $x = (-b/2a)$ and $f(-b/2a)$ to find the vertex of each quadratic equation. [5.3]

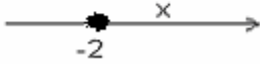
26. $y := x^2 + 2x$

27. $y := -x^2 - 2x + 3$

28. The Locker Room finds that it sells 1200-30p sweatshirts each month when it charges p dollars per sweatshirt. It would like its revenue from sweatshirts to be over \$9000 per month. In what range should it keep the price of a sweatshirt? Hint: Revenue = (Number of items sold) (Price per item). [5.4]



29. Complete the table. [5.4]

Inequality	Interval notation	Number line	Inequality in words
			x is between -2 and 2
			y is greater than or equal to 3
$y < -1$			
			

30-33. Find for what inputs each inequality is true. Write the answers as intervals. [5.4]

30) $4 - x^2 < x^2 + 6$

31) $5x^2 + 15x - 16 \geq 4 - 4x - x^2$

32) $24 - 0.25(x - 6)^2 < -5$

33) $24 - 0.25(x - 6)^2 > 11.75$

34-37. Simplify the following expressions. [6.2]

34. $(4-i) - (6-2i)$

35. $(2+4i) + (3+i) + 3 - (4+2i)$

36. $(2-i)(2+i)$

37.

$(x + i\sqrt{5})(x - i\sqrt{5})$



38 – 39. Change each expression to a complex number. [6.2]

38) $\frac{4 \pm \sqrt{-128}}{4}$

39) $-2\sqrt{-27}$

40- 43. Use the discriminant to predict the number and type of solutions to the following equations. [6.2]

40. $x^2 + 4 = 0$

41. $x^2 + 2x = 0$

42. $5x^2 - 2 = 0$

43. $4x^2 + 25 = 0$



44. Listed below are different functions with certain transformations. Find which functions satisfy the conditions $f(x) = m(x)$. It is not necessary to graph the functions. [6.3]

$f(x) := 2x^2 + 1$

$g(x) := 0.75(x + 1)^2 - 2$

$h(x) := \text{abs}(x - 2) + 1$

$j(x) := \frac{3x^2}{4} + 1$

$k(x) := \sqrt{x} + 1$

$m(x) := -0.5\sqrt{x + 1}$



- Which graphs shifted upward one unit?
- Which of the graphs compressed vertically?
- Which of the graphs shifted one unit to the left?
- Which of the graphs reflected about the x-axis?
- Which of the graphs shifted right two units and up one unit?
- Identify the vertex of $g(x)$, $f(x)$ and $j(x)$.

45-46. Find the equation of the parabola, given the vertex V and another point P . [6.3]

45. $V(-1, 2)$, $P(4, 7)$

46. $V(-3, 1)$, $P(-1, 0)$

47-49. Use factoring to find the x -intercepts, and then use $x = (-b/2a)$ and $f(-b/2a)$ to find the vertex of each quadratic equation. [6.4]

47. $f(x) := x^2 + 2x$

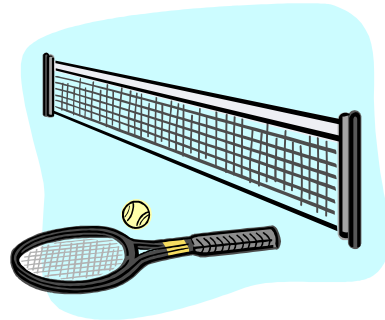
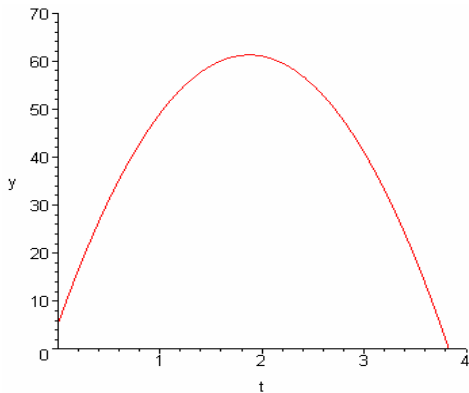
48. $f(x) := -x^2 - 2x + 3$

49. $f(x) := 3x^2 - 6x + 5$

50. In tennis a lob can be used to buy time to get into position. The approximate height S in feet for a tennis ball that is hit straight upward at v_0 ft/sec from a height of s_0 ft is modeled by

$$S = -16t^2 + v_0t + s_0$$

where t is time in seconds. [6.4]



- a. Use the above figure to estimate the time it takes a ball to return to the court when it is hit straight upward with velocity 60ft/sec from a height of 5 ft.
- b. Find the time for part (a) by using the quadratic formula.

51. A boxing ring has a perimeter of 80 feet and has the maximum possible area for a rectangular shape. Write the area as a function of only the width, and show that the vertex of the graph of the area function gives the maximum area.



Answers:

1a) No real number, b) $y = \pm 0.07$, c) $a = \pm 14$

2a) $3\sqrt{3}$

b) $2\sqrt{3}$

c) 0.02

d) 4

e) 1.1

f) 30

g) 0.5

3. $\{-2, -1/3\}$

4a) $\{\sqrt{14}\}$, b) $\{\sqrt{14}\}$. 5a) $\{-9/2, 9/2\}$, 6) $\{-3/2\}$, 7) $\{-2, 2\}$, 8) $\{\pm 65\}$

9. n = 8.5m, b) 10m

10) $\{-1.7, 1.7\}$, 11) $\{-1.4, 1.4\}$, 12) $a = \sqrt{\frac{C^2 - 2\pi^2 b^2}{2\pi^2}}$, 13) $A = \frac{\pi d^2}{4}$, 14) $2x+4$,

15) 46,

16) $(x+4)(x-2) = 0$, Ans: $\{-4, 2\}$, *rational*

17) $(3x-2)(2x-1) = 0$, Ans: $\left\{\frac{1}{2}, \frac{2}{3}\right\}$, *rational*

18) $(x+7)(x-6) = 0$, Ans: $\{-7, 6\}$, *rational*

19) $(4x-3)(3x-2) = 0$, Ans: $\left\{\frac{2}{3}, \frac{3}{4}\right\}$, *rational*

20) $\left\{\frac{-3 \pm \sqrt{-51}}{10}\right\}$, *not*

real

21) $-12m^3 + 36m^2n - 27n^2m$ 22) $(x-2)^2 = 3$

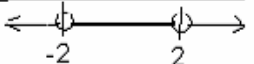
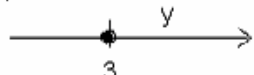
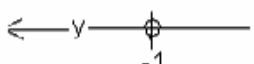
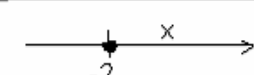
23) $\left(x - \frac{1}{2}\right)^2 = \frac{100}{4}$

24) Ans: (0.5, 1.75); 25) (0.375, 1.438)

26) (0,0), (-2,0), (-1,-1); 27) (1,0), (-3,0), (-1,4)

28) $R(p) = p(1200 - 30p) > 9000$

Ans: $10 < p < 30$

Inequality	Interval Notation	Number line	Inequality in words
$-2 < x < 2$	$(-2, 2)$		x is between -2 and 2
$y \geq 3$	$[3, \infty)$		y is greater than or equal to 3
$y < -1$	$(-\infty, -1)$		y is less than -1
$x \geq -2$	$[-2, \infty)$		x is greater than or equal to -2

29.

30) $(-\infty, \infty)$ 31) $(-\infty, -4] \cup \left[\frac{5}{6}, \infty\right)$ 32) $(-\infty, -4.77) \cup (16.77, \infty)$ 33) $(-1, 13)$

34) $-2 + i$ 35) $4 + 3i$ 36) 5 37) $x^2 + 5$ 38) $1 \pm 2i\sqrt{2}$ 39) $-6i\sqrt{3}$

40) Two complex solutions 41) two real solutions 42) two real solutions 43) two complex solutions.

44a. $f(x)$, $h(x)$, $j(x)$ and $k(x)$, b) $g(x)$, $j(x)$, and $m(x)$, c) $g(x)$ and $m(x)$, d) $m(x)$, e) $h(x)$, f)

The vertex of $g(x)$ is $(-1, -2)$, The vertices of $f(x)$ and $j(x)$ are both $(0, 1)$

45) $f(x) := \frac{(x+1)^2}{5} + 2$

46) $f(x) = -0.25(x+3)^2 + 1$

47) $(0, 0)$, $(-2, 0)$, $(-1, -1)$; 48) $(1, 0)$, $(-3, 0)$, $(-1, 4)$; 49) no x-intercepts; $(1, 2)$

50) Ans: approx. 3.7 seconds. b) Use $v_o = 60$, $s_0 = 5$ and $S = 0$ in the given formula:

$$0 = -16t^2 + 60t + 5$$

Use the quadratic formula to solve the equation $\rightarrow t = \frac{15 \pm 7\sqrt{5}}{8}$ Since the time at which

the ball returns to the earth must be positive, it will take exactly $\frac{15 + 7\sqrt{5}}{8}$ seconds or

approximately 3.83 seconds for the ball to hit the earth.

51) $A(w) = 40w - w^2$; vertex $(20, 400)$;
Maxm. Area = 400

