

Name: Answer Key

Date: _____

Intermediate Algebra Chapter 9 and 10 Test

Please show all work. If there is not enough room use a separate piece of paper but make sure the answers are written on this paper.

6 1)

$$\begin{cases} 5x - 3y + 2z = 39 \\ 4x + 4y - 3z = 34 \\ 3x - 2y + 6z = 14 \end{cases}$$

6 2)

Monica has \$1, \$5, and \$10 bills in her wallet that are worth \$96. If she had one more \$1 bill, she would have just as many \$1 bills as \$5 and \$10 bills combined. She has 23 bills total. How many of each denomination does she have?

$$\begin{aligned}
 1) \quad & 5x - 3y + 2z = 39 \\
 & 4x + 4y - 3z = 34 \\
 & 3x - 2y + 6z = 14
 \end{aligned}$$

6 parts

$$\begin{array}{r}
 \text{1 and 3} \quad 5x - 3y + 2z = 39 \quad \times 3 \quad 15x - 9y + 6z = 117 \\
 \quad \quad \quad 3x - 2y + 6z = 14 \quad \times 1 \quad -3x + 2y + 6z = -14 \\
 \hline
 \quad 12x - 7y \quad = 103
 \end{array}$$

$$\begin{array}{r}
 \text{2 and 3} \quad 4x + 4y - 3z = 34 \quad \times 3 \quad 12x + 12y - 9z = 102 \\
 \quad \quad \quad 3x - 2y + 6z = 14 \quad \times 2 \quad 6x - 4y + 12z = 28 \\
 \hline
 \quad 11x + 6y \quad = 82
 \end{array}$$

$$\begin{array}{r}
 12x - 7y = 103 \quad \rightarrow 6 \quad 72x - 42y = 618 \\
 11x + 6y = 82 \quad \rightarrow 7 \quad 77x + 42y = 574 \\
 \hline
 149x \quad = 1192
 \end{array}$$

$$x = 8$$

$$12(8) - 7y = 103$$

$$96 - 7y = 103$$

$$-7y = 7$$

$$y = -1$$

$$5(8) - 3(-1) + 2z = 39$$

$$40 + 3 + 2z = 39$$

$$43 + 2z = 39$$

$$2z = -4$$

$$z = -2$$

$$(8, -1, -2)$$

$$2) \quad \$1 = x \quad \$5 = y \quad \$10 = z$$

$$1x + 5y + 10z = 96$$

$$x + y + z = 23$$

$$x + 1 = y + z \rightarrow -x + y + z = 1$$

$$x + y + z = 23$$

$$\frac{-x + y + z = 1}{}$$

$$2y + 2z = 24$$

$$x + 5y + 10z = 96$$

$$\frac{-x + y + z = 1}{}$$

$$6y + 11z = 97$$

$$11 \rightarrow \$1$$

$$7 \rightarrow \$5$$

$$5 \rightarrow \$10$$

$$2y + 2z = 24 \quad \times 3$$

$$6y + 11z = 97 \quad \times 1$$

$$6y + 6z = 72$$

$$\frac{-6y + 11z = 97}{}$$

$$-5z = -25$$

$$z = 5$$

$$2y + 2(5) = 24$$

$$2y + 10 = 24$$

$$2y = 14$$

$$y = 7$$

$$x + 1 = 7 + 5$$

$$x + 1 = 12$$

$$x = 11$$

x 2 3)

Simplify. Remember to use absolute-value notation when necessary. If a root cannot be simplified, state this.

$$\sqrt{9x^2 - 6x + 1} \\ \sqrt{(3x-1)^2} = |3x-1|$$

+2 4)

Use the laws of exponents to simplify.

$$(2^{-2})^{-2} = 2^{14/32} = 2^{7/16}$$

+3 5)

Divide. Then simplify by taking roots, if possible. Assume all expressions under radicals represent positive numbers.

$$\frac{\sqrt{400xy}}{2\sqrt{2}} = \frac{20\sqrt{xy}\sqrt{2}}{2\sqrt{2}\sqrt{2}} = \frac{20\sqrt{2xy}}{4} = 5\sqrt{2xy}$$

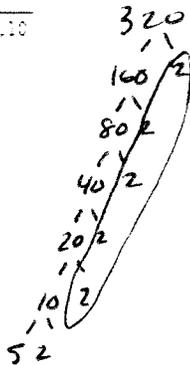
+3 6)

Simplify by factoring. Assume that all expressions under the radical represent nonnegative numbers.

$$\sqrt[5]{320x^7y^{10}}$$

$$2xy^2\sqrt[5]{10x^2}$$

+2 7)



Use rational exponents to simplify.

$$\sqrt{(ab)^8}$$

$$(ab)^{8/2} = (ab)^4 = a^4b^4$$

+1 8)

Write an equivalent expression using radical notation.

$$(a^4b^4)^{7/4}$$

$$\sqrt[4]{a^4b^4}$$

+3 9)

Multiply:

$$(6-3i)(4-i)$$

$$24 - 24i - 12i + 12i^2$$

-12

$$12 - 36i$$

+3 10)

Multiply. Assume all variables represent nonnegative real numbers.

$$(\sqrt{7x} - \sqrt{y})^2$$

$$(\sqrt{7x} + \sqrt{y})(\sqrt{7x} + \sqrt{y})$$

$$7x + 2\sqrt{7xy} + y$$

$$7x + \sqrt{7xy} + \sqrt{7xy} + y$$

+3 11)

Multiply as indicated. If possible, simplify any radical expressions that appear in the product.

$$(2-\sqrt{5})(6-\sqrt{5})$$

$$12 - 8\sqrt{5} + 6\sqrt{5} - 20$$

$$-8 - 2\sqrt{5}$$

+2 12)

Multiply and simplify. Assume that no radicands were formed by raising negative numbers to even powers.

$$\sqrt{6x^3} \sqrt{18x^2}$$

$\wedge \quad \wedge$
 $2\ 3 \quad 6\ 3$
 \wedge
 $2\ 3$

$$6x^2 \sqrt{3x}$$

+3 13)

Subtract. Simplify by collecting like radical terms if possible, assuming that all expressions under radicals represent non-negative numbers

$$\sqrt[3]{80x} - \sqrt[3]{10x^2}$$



$$\begin{array}{r} 80 \\ 40 \cdot 2 \\ 20 \cdot 4 \\ 5 \cdot 4 \end{array}$$

$$2\sqrt[3]{10x} - x\sqrt[3]{10x}$$
$$(2-x)(\sqrt[3]{10x})$$

+2 14)

Rationalize the denominator. Assume that all expressions under radicals represent positive numbers.

$$\frac{\sqrt[3]{7a}}{\sqrt[3]{2c} \sqrt[3]{2c} \sqrt[3]{2c}} = \frac{\sqrt[3]{28ac^2}}{2c}$$

+3 15)

Rationalize the denominator. Assume that all expressions under radicals represent positive numbers.

$$\frac{\sqrt{c} (\sqrt{c} - \sqrt{d})}{(\sqrt{c} + \sqrt{d}) (\sqrt{c} - \sqrt{d})}$$

$$\frac{c - \sqrt{cd}}{c - d}$$

+6 16)

Solve.

$$\sqrt{2x+7} - 2 = x$$

$$\sqrt{2x+7} = x+2$$

$$2x+7 = x^2+4x+4$$

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

$$(x+3)(x-1) = 0$$

$$x = -3$$

$$x = 1$$

$$\sqrt{2(-3)+7} - 2 = x$$

$$\sqrt{1} - 2$$

$$1 - 2 = -3$$

$$-1 = -3 \quad x$$

$$\sqrt{2(1)+7}$$

$$\sqrt{9} - 2$$

$$3 - 2 = 1$$

$$1 = 1 \quad \checkmark$$

+7 17)

Solve.

$$\sqrt{x+3} - \sqrt{3x+7} = 2$$

$$\sqrt{x+3} = 2 + \sqrt{3x+7}$$

$$x+3 = 4 - 2\sqrt{3x+7} + 3x+7$$

$$-2x-8 = -2\sqrt{3x+7}$$

$$2x-8 = 4\sqrt{3x+7} \quad 4x^2+112$$

$$4x^2 - 32x + 64 = 16(3x+7)$$

$$4x^2 - 80x - 48 = 0$$

$$x^2 - 20x - 12 = 0$$

+3 18)

Solve.

$$\sqrt{6y+5} = \sqrt{5y+8}$$

$$6y+5 = 5y+8$$

$$y = 3$$

$$\sqrt{6(3)+5} = \sqrt{5(3)+8}$$

$$\sqrt{18+5} = \sqrt{15+8}$$

$$\sqrt{23} = \sqrt{23} \quad \checkmark$$

$$\sqrt{x+3} + \sqrt{3x+7} = 2$$

$$\sqrt{x+3} = 2 - \sqrt{3x+7}$$

$$x+3 = 4 - 4\sqrt{3x+7} + (3x+7)$$

$$x+3 = 11 + 3x - 4\sqrt{3x+7}$$

$$(-2x - 8 = -4\sqrt{3x+7})^{-\frac{1}{2}}$$

$$x+4 = 2\sqrt{3x+7}$$

$$x^2 + 8x + 16 = 4(3x+7)$$

$$x^2 + 8x + 16 = 12x + 28$$

$$x^2 - 4x - 12 = 0$$

$$(x-6)(x+2) = 0$$

$$x=6 \quad x=-2$$

Check

$$\sqrt{6+3} + \sqrt{3(6)+7} = 2$$

$$\sqrt{9} + \sqrt{25} = 2$$

$$3 + 5 = 2$$

$$8 = 2 \quad \times$$

$$\sqrt{-2+3} + \sqrt{3(-2)+7} = 2$$

$$\sqrt{1} + \sqrt{1} = 2$$

$$1 + 1 = 2 \quad \checkmark$$

$$2 = 2$$

+3 19)

Divide

$$\frac{7i}{9-6i}$$

~~$\frac{7i(9+6i)}{(9-6i)(9+6i)}$~~ ~~$\frac{63i-42}{81+36}$~~ ~~$\frac{-42}{117} + \frac{63i}{117}$~~ ~~$\frac{-14}{39} + \frac{21i}{39}$~~ ~~$\frac{-14}{39} + \frac{7i}{13}$~~

$$\frac{7i(9+6i)}{(9-6i)(9+6i)}$$

$$\frac{63i-42}{81+36}$$

$$\frac{-42}{117} + \frac{63i}{117}$$

$$\frac{-14}{39} + \frac{21i}{39}$$

$$\frac{-14}{39} + \frac{7i}{13}$$

+2 20)

Express in terms of i .

$$\sqrt{-64} - \sqrt{-45}$$

$$8i + 3i\sqrt{5}$$