

**MATHEMATICS 125 TEST CHAPTER 10 --- FALL 2004 (EXPONENTS AND RADICALS)**  
**INSTRUCTOR: ANNE SISWANTO; TOTAL POINTS: 100; TIME: 70 MINUTES**

DIRECTION: GRAPHING CALCULATORS ARE NOT ALLOWED. SHOW ALL WORKS ON THE TEST PAPER FOR FULL CREDIT

## QUESTION 1 (15 POINTS)

Simplify, assume all variables are positive numbers, and leave no negative exponents.

$$\text{a. } \langle 3 \rangle \left(\frac{25}{36}\right)^{-3/2} = \left(\frac{36}{25}\right)^{3/2} = \frac{(\sqrt{36})^3}{(\sqrt{25})^3} = \frac{216}{125}$$

$$\begin{aligned} \text{b. } \langle 3 \rangle 12\sqrt{\frac{20x^4}{3}} &= 12 \frac{\sqrt{20x^4}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{12}{3} \sqrt{60x^4} = 4\sqrt{4 \cdot 15x^4} \\ &= \underline{8x^2\sqrt{15}} \end{aligned}$$

$$\text{c. } \langle 3 \rangle \sqrt[3]{64x^6y^9} = \underline{4x^2y^3}$$

$$\begin{aligned} \text{d. } \langle 3 \rangle \sqrt{48x^5y^3} &= \sqrt{16 \cdot 3x^4xy^2y} \\ &= \underline{4x^2y\sqrt{3xy}} \end{aligned}$$

$$\text{e. } \langle 3 \rangle \sqrt{9x^2 - 36x + 36} = \sqrt{(3x-6)^2} = |3x-6| \text{ or } 3|x-2|$$

do NOT forget the abs. value

## QUESTION 2 (10 POINTS)

Perform the operation and simplify.

$$\begin{aligned} \text{a. } \langle 4 \rangle (\sqrt{3} - \sqrt{7})^2 &= (\sqrt{3})^2 - 2(\sqrt{3})(\sqrt{7}) + (\sqrt{7})^2 \\ &= 3 - 2\sqrt{21} + 7 \\ &= \underline{10 - 2\sqrt{21}} \end{aligned}$$

$$\begin{aligned}
 \text{b. } \langle 4 \rangle (\sqrt{6} - 2\sqrt{5})(2\sqrt{6} - \sqrt{5}) &= \sqrt{6}(2\sqrt{6}) - \sqrt{6}(\sqrt{5}) - 2\sqrt{5}(2\sqrt{6}) + 2(\sqrt{5})(\sqrt{5}) \\
 &= 12 - \sqrt{30} - 4\sqrt{30} + 10 \\
 &= \underline{\underline{22 - 5\sqrt{30}}}
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } \langle 3 \rangle 5\sqrt{50} + 7\sqrt{98} &= 5\sqrt{25 \cdot 2} + 7\sqrt{49 \cdot 2} \\
 &= 25\sqrt{2} + 49\sqrt{2} \\
 &= \underline{\underline{74\sqrt{2}}}
 \end{aligned}$$

QUESTION 3 (10 POINTS)

Rationalize the denominator:

$$\text{a. } \langle 5 \rangle \frac{5}{\sqrt{3}-1} \cdot \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{5\sqrt{3}+5}{3-1} = \underline{\underline{\frac{5\sqrt{3}+5}{2}}}$$

$$\text{b. } \langle 5 \rangle \frac{(2+\sqrt{5})}{6-\sqrt{3}} \cdot \frac{(6+\sqrt{3})}{6+\sqrt{3}} = \frac{12+2\sqrt{3}+6\sqrt{5}+\sqrt{15}}{36-3} = \underline{\underline{\frac{12+2\sqrt{3}+6\sqrt{5}+\sqrt{15}}{33}}}$$

QUESTION 4 (30 POINTS)

Solve the following radical equation.

$$\begin{aligned}
 \text{a. } \langle 6 \rangle \sqrt[4]{x+3} = 2 & \quad \text{raise both side to } 4^{\text{th}} \text{ power} \\
 x+3 = 2^4 & \quad \text{check: } \sqrt[4]{13+3} = 2 \quad \text{TRUE} \\
 x+3 = 16 \\
 \underline{\underline{x = 13}} & \quad \leftarrow \text{a solution}
 \end{aligned}$$

$$b. <8> \sqrt{3x+1} + 5 = 7$$

$$\frac{\sqrt{3x+1}}{-5} = \frac{2}{-5} \quad \text{square both sides}$$

$$3x+1 = 4$$

$$3x = 3$$

$$\underline{\underline{x = 1}} \quad \leftarrow \text{a solution}$$

$$\text{check } \sqrt{3(1)+1} + 5 = 7$$

$$2 + 5 = 7 \quad \text{TRUE}$$

$$c. <8> 3 + \sqrt{5-x} = x \quad \text{subtract 3}$$

$$\frac{\sqrt{5-x}}{-5} = \frac{x-3}{-5} \quad \text{square both sides}$$

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

$$\frac{5-x}{-5} = \frac{x^2 - 6x + 9}{-5}$$

$$0 = x^2 - 5x + 4$$

$$0 = (x-4)(x-1)$$

$$\underline{\underline{x = 4}} \quad \text{or} \quad \underline{\underline{x = 1}}$$

a solution                      Not a solution

$$\text{check: } \underline{x = 4}$$

$$3 + \sqrt{5-4} = 4$$

$$3 + 1 = 4 \quad \text{TRUE}$$

$$\underline{x = 1}$$

$$3 + \sqrt{5-1} = 4 \quad \text{False}$$

$$d. <8> \sqrt{2x-5} = 1 + \sqrt{x-3} \quad \text{square both sides}$$

$$2x-5 = 1 + 2(1)(\sqrt{x-3}) + x-3$$

$$\frac{2x-5}{-x+2} = \frac{2\sqrt{x-3} + x-2}{-x+2}$$

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

$$x^2 - 6x + 9 = 4(x-3)$$

$$\frac{x^2 - 6x + 9}{-4x + 12} = \frac{4x - 12}{-4x + 12}$$

$$x^2 - 10x + 21 = 0$$

$$(x-3)(x-7) = 0$$

$$\underline{\underline{x = 3}} \quad \text{or} \quad \underline{\underline{x = 7}}$$

a solution                      a solution

check:

$$x=3 \Rightarrow \sqrt{2(3)-5} = 1 + \sqrt{3-3}$$

$$1 = 1 \quad \text{TRUE}$$

$$x=7 \Rightarrow \sqrt{2(7)-5} = 1 + \sqrt{7-3}$$

$$3 = 1 + 2 \quad \text{TRUE}$$

#### QUESTION 5 (20 POINTS)

Perform the indicated operations.

$$a. <5> 5+4i - [(2-3i) - (6+i)]$$

$$= 5+4i - [2-3i-6-i]$$

$$= 5+4i - 2+3i+6+i$$

$$= \underline{\underline{9+8i}}$$

$$b. <5> (3-5i)^2 = 3^2 - 2(3)(5i) + (5i)^2$$

$$= 9 - 30i + 25i^2$$

$$= 9 - 30i - 25$$

$$= \underline{\underline{-16-30i}}$$

$$c. \langle 5 \rangle \frac{3}{2-i} \cdot \frac{2+i}{2+i} = \frac{6+3i}{2^2-i^2} = \frac{6+3i}{4+1} = \frac{6+3i}{5}$$

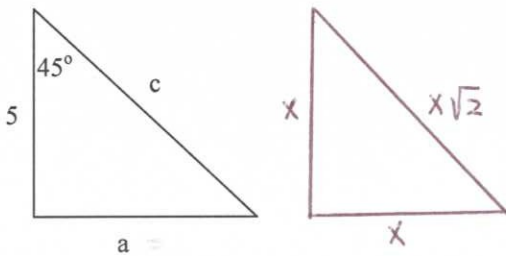
$$d. \langle 5 \rangle \frac{(7-2i)}{3+4i} \cdot \frac{(3-4i)}{3-4i} = \frac{21-28i-6i+8i^2}{3^2-(4i)^2} = \frac{21-34i-8}{9-16i^2}$$

$$= \frac{13-34i}{9+16} = \frac{13-34i}{25}$$

QUESTION 6 (15 POINTS)

For each triangle, find the missing length(s). Give an exact answer and an approximation to 3 decimal places.

a.  $\langle 5 \rangle$

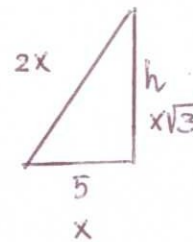
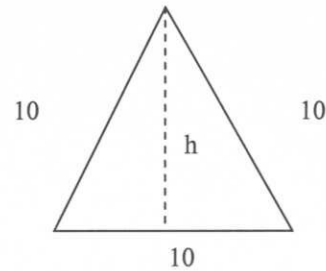


$$x = 5 \rightarrow x\sqrt{2} = 5\sqrt{2} \approx 7.071$$

$$\therefore a = 5$$

$$\underline{\underline{c = 5\sqrt{2} \approx 7.071}}$$

b.  $\langle 5 \rangle$

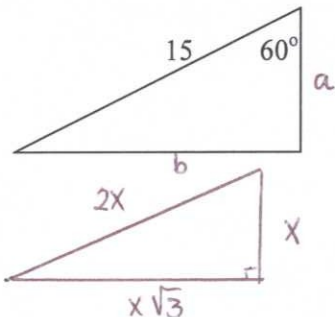


$$x = 5$$

$$h = x\sqrt{3} = 5\sqrt{3}$$

$$\underline{\underline{\approx 8.660}}$$

c.  $\langle 5 \rangle$



$$2x = 15$$

$$a = x = 7.5$$

$$\underline{\underline{b = x\sqrt{3} = 7.5\sqrt{3} \approx 12.990}}$$