

# Math251

## Practice Exam #05

1. Re-write each radical expression using only positive exponents. Simplify if possible.

a)  $\sqrt[5]{x^2}$

b)  $\sqrt[3]{27x^{12}y^9}$

c)  $\sqrt[3]{\sqrt[5]{x^2}}$

2. Simplify the following.

a)  $6\sqrt{18} - 5\sqrt{32}$

b)  $5\sqrt{6} - 3\sqrt{24} + 6\sqrt{54}$

c)  $3\sqrt{3} \cdot 6\sqrt{3}$

3. Simplify the radical expressions.

a)  $\sqrt{32x^5y^3z^9}$

b)  $\sqrt[3]{32x^5y^3z^9}$

c)  $\sqrt[4]{32x^5y^3z^9}$

4. Solve for x.

a)  $x^2 = 25$

b)  $x^2 - 3x = 0$

c)  $2x^2 - 5x - 3 = 0$

5. Solve for x.

a)  $\sqrt{4x+1} = 3$

b)  $\sqrt{7-3x} - 4 = 0$

c)  $\sqrt{x} = 4$

6. Solve by completing the square.

a)  $x^2 - 4x + 2 = 0$

b)  $18x^2 - 6x - 1 = 0$

c)  $2x^2 - 6x + 2 = 0$

7. Rationalize the denominators.

a)  $\frac{3}{\sqrt{2}}$

b)  $\frac{3}{2-\sqrt{2}}$

c)  $\frac{3}{\sqrt[3]{4}}$

8. Simplify the radical expressions.

a)  $\sqrt{24}$

b)  $\sqrt[3]{54}$

c)  $(\sqrt{3}-\sqrt{4})(\sqrt{3}+\sqrt{5})$

9. Solve by using the quadratic equation.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

a)  $x^2 - 4x + 2 = 0$

b)  $2x^2 - 5x - 3 = 0$

c)  $2x^2 - 6x + 2 = 0$

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## Practice Exam #05

1. Re-write each radical expression using only positive exponents. Simplify if possible.

a)  $\sqrt[3]{x^2}$

$$\boxed{x^{\frac{2}{3}}}$$

b)  $\sqrt[3]{27x^{12}y^9}$

$$\boxed{3x^4y^3}$$

c)  $\sqrt[5]{x^2}$

$$\sqrt[5]{x^{\frac{2}{5}}}$$

$$\left(x^{\frac{2}{5}}\right)^{\frac{1}{5}}$$

$$x^{\frac{2}{5} \cdot \frac{1}{5}}$$

$$\boxed{x^{\frac{2}{25}}}$$

2. Simplify the following.

a)  $6\sqrt{18} - 5\sqrt{32}$

$$6\sqrt{9 \cdot 2} - 5\sqrt{16 \cdot 2}$$

$$6 \cdot 3\sqrt{2} - 5 \cdot 4\sqrt{2}$$

$$18\sqrt{2} - 20\sqrt{2}$$

$$\boxed{-2\sqrt{2}}$$

b)  $5\sqrt{6} - 3\sqrt{24} + 6\sqrt{54}$

$$5\sqrt{6} - 3\sqrt{4 \cdot 6} + 6\sqrt{9 \cdot 6}$$

$$5\sqrt{6} - 3 \cdot 2\sqrt{6} + 6 \cdot 3\sqrt{6}$$

$$5\sqrt{6} - 6\sqrt{6} + 18\sqrt{6}$$

$$\boxed{17\sqrt{6}}$$

c)  $3\sqrt{3} \cdot 6\sqrt{3}$

$$3 \cdot \sqrt{3} \cdot 6 \cdot \sqrt{3}$$

$$18 \cdot 3$$

$$\boxed{54}$$

3. Simplify the radical expressions.

a)  $\sqrt{32x^5y^3z^9}$

$$\sqrt{16 \cdot 2 \cdot x^4 \cdot x \cdot y^2 \cdot y \cdot z^8 \cdot z}$$

$$\boxed{4x^2yz^4\sqrt{2xyz}}$$

b)  $\sqrt[3]{32x^5y^3z^9}$

$$\sqrt[3]{8 \cdot 4 \cdot x^3 \cdot x^2 \cdot y^3 \cdot z^9}$$

$$\boxed{2xyz^3\sqrt[3]{4x^2}}$$

c)  $\sqrt[4]{32x^5y^3z^9}$

$$\sqrt[4]{16 \cdot 2 \cdot x^4 \cdot x \cdot y^3 \cdot z^8 \cdot z}$$

$$\boxed{2xz^2\sqrt[4]{2xy^3z}}$$

4. Solve for x.

a)  $x^2 = 25$

$$\sqrt{x^2} = \pm\sqrt{25}$$

$$\boxed{x = \pm 5}$$

b)  $x^2 - 3x = 0$

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

$$\boxed{x=0} \quad \begin{array}{l} x-3=0 \\ +3 \quad +3 \\ \hline \boxed{x=3} \end{array}$$

c)  $2x^2 - 5x - 3 = 0$

a.c = -6  
Sum -5  
 $\begin{array}{r} 6 \\ -1 \end{array}$

$$2x^2 - 6x + x - 3 = 0$$

$$2x(x-3) + 1(x-3) = 0$$

$$(x-3)(2x+1) = 0$$

$$\begin{array}{l} x-3=0 \\ +3 \quad +3 \\ \hline \boxed{x=3} \end{array} \quad \begin{array}{l} 2x+1=0 \\ -1 \quad -1 \\ \hline 2x = -1 \\ \frac{2x}{2} = \frac{-1}{2} \\ \hline \boxed{x = -\frac{1}{2}} \end{array}$$

5. Solve for x.

a)  $\sqrt{4x+1} = 3$

$$(\sqrt{4x+1})^2 = 3^2$$

$$4x+1 = 9$$

$$4x = 8$$

$$\boxed{x = 2}$$

b)  $\sqrt{7-3x-4} = 0$

$$+4 \quad +4$$

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

$$(\sqrt{7-3x})^2 = (4)^2$$

$$7-3x = 16$$

$$-3x = 9$$

$$\boxed{x = -3}$$

c)  $\sqrt{x} = 4$

$$(\sqrt{x})^2 = 4^2$$

$$\boxed{x = 16}$$

6. Solve by completing the square.

a)  $x^2 - 4x + 2 = 0$

$$-2 \quad -2$$

$$x^2 - 4x = -2$$

$$\frac{1}{2}(-4) \rightarrow x^2 - 4x + 4 = -2 + 4$$

$$-2 \rightarrow (x-2)^2 = 2$$

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

$$\boxed{4} \rightarrow x-2 = \pm\sqrt{2}$$

$$+2 \quad +2$$

$$\boxed{x = 2 \pm \sqrt{2}}$$

b)  $18x^2 - 6x - 1 = 0$

$$\frac{18}{18} \quad \frac{-6}{18} \quad \frac{-1}{18}$$

$$x^2 - \frac{1}{3}x - \frac{1}{18} = 0$$

$$+\frac{1}{18} \quad +\frac{1}{18}$$

$$x^2 - \frac{1}{3}x = \frac{1}{18}$$

$$\frac{1}{2}\left(-\frac{1}{3}\right) \rightarrow x^2 - \frac{1}{3}x + \frac{1}{36} = \frac{1}{18} + \frac{1}{36}$$

$$-\frac{1}{6} \rightarrow (x - \frac{1}{6})^2 = \frac{1}{18} + \frac{1}{36}$$

$$(-\frac{1}{6})^2 \rightarrow (x - \frac{1}{6})^2 = \frac{2}{36} + \frac{1}{36}$$

$$\frac{1}{36} \rightarrow (x - \frac{1}{6})^2 = \frac{3}{36}$$

$$\sqrt{(x - \frac{1}{6})^2} = \pm\sqrt{\frac{3}{36}}$$

$$x - \frac{1}{6} = \pm\sqrt{\frac{3}{36}}$$

$$+\frac{1}{6} \quad +\frac{1}{6}$$

$$\boxed{x = \frac{1}{6} \pm \frac{\sqrt{3}}{6}}$$

c)  $2x^2 - 6x + 2 = 0$

$$\frac{2}{2} \quad \frac{-6}{2} \quad \frac{2}{2}$$

$$x^2 - 3x + 1 = 0$$

$$-1 \quad -1$$

$$x^2 - 3x = -1$$

$$\frac{1}{2}(-3) \rightarrow x^2 - 3x + \frac{9}{4} = -1 + \frac{9}{4}$$

$$-\frac{3}{2} \rightarrow (x - \frac{3}{2})^2 = -\frac{4}{4} + \frac{9}{4}$$

$$(-\frac{3}{2})^2 \rightarrow (x - \frac{3}{2})^2 = \frac{5}{4}$$

$$\frac{9}{4} \rightarrow \sqrt{(x - \frac{3}{2})^2} = \pm\sqrt{\frac{5}{4}}$$

$$x - \frac{3}{2} = \pm\sqrt{\frac{5}{4}}$$

$$+\frac{3}{2} \quad +\frac{3}{2}$$

$$\boxed{x = \frac{3}{2} \pm \frac{\sqrt{5}}{2}}$$

7. Rationalize the denominators.

a)  $\frac{3}{\sqrt{2}}$

$$\frac{3}{\sqrt{2}} \left( \frac{\sqrt{2}}{\sqrt{2}} \right)$$

$$\boxed{\frac{3\sqrt{2}}{2}}$$

b)  $\frac{3}{2-\sqrt{2}}$

$$\frac{3}{(2-\sqrt{2})} \left( \frac{2+\sqrt{2}}{2+\sqrt{2}} \right)$$

$$\frac{3(2+\sqrt{2})}{(2)^2 - (\sqrt{2})^2}$$

$$\frac{3(2+\sqrt{2})}{4-2}$$

$$\boxed{\frac{3(2+\sqrt{2})}{2}}$$

c)  $\frac{3}{\sqrt[3]{4}}$

$$\frac{3}{\sqrt[3]{4}} \left( \frac{\sqrt[3]{2}}{\sqrt[3]{2}} \right)$$

$$\frac{3\sqrt[3]{2}}{\sqrt[3]{8}}$$

$$\boxed{\frac{3\sqrt[3]{2}}{2}}$$

8. Simplify the radical expressions.

a)  $\sqrt{24}$

$$\sqrt{4 \cdot 6}$$

$$\boxed{2\sqrt{6}}$$

b)  $\sqrt[3]{54}$

$$\sqrt[3]{27 \cdot 2}$$

$$\boxed{3\sqrt[3]{2}}$$

c)  $(\sqrt{3}-\sqrt{4})(\sqrt{3}+\sqrt{5})$

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

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

$$\sqrt{9} - 2\sqrt{3} + \sqrt{15} - 2\sqrt{5}$$

$$\boxed{3 - 2\sqrt{3} + \sqrt{15} - 2\sqrt{5}}$$

9. Solve by using the quadratic equation.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

a)  $x^2 - 4x + 2 = 0$

$a=1$   $b=-4$   $c=2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(2)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 - 8}}{2}$$

$$x = \frac{4 \pm \sqrt{8}}{2}$$

$$x = \frac{4 \pm \sqrt{4 \cdot 2}}{2}$$

$$x = \frac{4 \pm 2\sqrt{2}}{2}$$

$$x = \frac{2(2 \pm \sqrt{2})}{2}$$

$$x = 2 \pm \sqrt{2}$$

b)  $2x^2 - 5x - 3 = 0$

$a=2$   $b=-5$   $c=-3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25 - (-24)}}{4}$$

$$x = \frac{5 \pm \sqrt{25 + 24}}{4}$$

$$x = \frac{5 \pm \sqrt{49}}{4}$$

$$x = \frac{5 \pm 7}{4}$$

$$x = \frac{5+7}{4} \text{ or } x = \frac{5-7}{4}$$

$$x = \frac{12}{4} \quad x = \frac{-2}{4}$$

$$x = 3$$

$$x = -\frac{1}{2}$$

c)  $2x^2 - 6x + 2 = 0$

$a=2$   $b=-6$   $c=2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(2)}}{2(2)}$$

$$x = \frac{6 \pm \sqrt{36 - 16}}{4}$$

$$x = \frac{6 \pm \sqrt{20}}{4}$$

$$x = \frac{6 \pm \sqrt{4 \cdot 5}}{4}$$

$$x = \frac{6 \pm 2\sqrt{5}}{4}$$

$$x = \frac{2(3 \pm \sqrt{5})}{4}$$

$$x = \frac{3 \pm \sqrt{5}}{2}$$