

Spring 2019

Period: \_\_\_\_\_

Name: KEY

Chapter 5 Assignment – Radical Expressions & Equations

/30

Show all of your work.

1) Simplify (1 mark each):

$$\begin{aligned} \text{a) } & \sqrt{16x^7} \\ & = \sqrt{16 \cdot x^6 \cdot x^1} \\ & = 4x^3 \sqrt{x} \end{aligned}$$

$$\begin{aligned} \text{b) } & \sqrt{90} \\ & = \sqrt{9 \cdot 10} \\ & = \sqrt{9} \cdot \sqrt{10} \\ & = 3\sqrt{10} \end{aligned}$$

$$\begin{aligned} \text{c) } & \sqrt{20x^8y^5} \\ & = \sqrt{4 \cdot 5 \cdot x^8 \cdot y^4 \cdot y^1} \\ & = 2x^4y^2\sqrt{5y} \end{aligned}$$

$$\begin{aligned} \text{d) } & \sqrt[3]{125m^{11}} \\ & = \sqrt[3]{125 \cdot m^9 \cdot m^2} \\ & = 5m^3\sqrt[3]{m^2} \end{aligned}$$

ANSWER:  $4x^3\sqrt{x}$

ANSWER:  $3\sqrt{10}$

ANSWER:  $2x^4y^2\sqrt{5y}$

ANSWER:  $5m^3\sqrt[3]{m^2}$

2) Change to an entire radical (1 mark each):

$$\begin{aligned} \text{a) } & 4\sqrt{5} \\ & \xrightarrow{4^2} \sqrt{16 \cdot 5} \\ & = \sqrt{16 \cdot 5} \\ & = \sqrt{80} \end{aligned}$$

$$\begin{aligned} \text{b) } & 2^3\sqrt{6} \\ & = \sqrt[3]{8 \cdot 6} \\ & = \sqrt[3]{8 \cdot 6} \\ & = \sqrt[3]{48} \end{aligned}$$

ANSWER:  $\sqrt{80}$

ANSWER:  $\sqrt[3]{48}$

3) Write another way (as a radical), then simplify (1 mark):  $32^{\frac{1}{4}}$  flower = power  
roots = root (index)

$$\begin{aligned} & = \sqrt[4]{32} = \sqrt[4]{32} = \sqrt[4]{16 \cdot 2} \\ & = 2\sqrt[4]{2} \end{aligned}$$

ANSWER:  $2\sqrt[4]{2}$

4) Simplify (2 marks each):

$$\begin{aligned}
 \text{a) } & -6\sqrt{12} + 2\sqrt{8} - 5\sqrt{75} \\
 & = -6\sqrt{4 \cdot 3} + 2\sqrt{4 \cdot 2} - 5\sqrt{25 \cdot 3} \\
 & = -6 \cdot 2\sqrt{3} + 2 \cdot 2\sqrt{2} - 5 \cdot 5\sqrt{3} \\
 & = -12\sqrt{3} + 4\sqrt{2} - 25\sqrt{3} \\
 & = 4\sqrt{2} - 37\sqrt{3}
 \end{aligned}$$

ANSWER:  $4\sqrt{2} - 37\sqrt{3}$

$$\begin{aligned}
 \text{b) } & 3\sqrt[3]{16x^4y^5} - xy\sqrt[3]{54xy^2} \\
 & = 3\sqrt[3]{8 \cdot 2 \cdot x^3 \cdot x \cdot y^3 \cdot y^2} - xy\sqrt[3]{27 \cdot 2 \cdot x \cdot y^2} \\
 & = 3 \cdot 2 \cdot x \cdot y\sqrt[3]{2xy^2} - xy \cdot 3\sqrt[3]{2xy^2} \\
 & = 6xy\sqrt[3]{2xy^2} - 3xy\sqrt[3]{2xy^2} \\
 & = 3xy\sqrt[3]{2xy^2}
 \end{aligned}$$

ANSWER:  $3xy\sqrt[3]{2xy^2}$

5) Simplify (2 marks each):

$$\begin{aligned}
 \text{a) } & -2\sqrt{6x}(3\sqrt{2x}) \\
 & = (-2)(3) \cdot \sqrt{6x} \cdot \sqrt{2x} \\
 & = -6\sqrt{12x^2} \\
 & = -6\sqrt{4 \cdot 3 \cdot x^2} \\
 & = -6 \cdot 2 \cdot x\sqrt{3} \\
 & = -12x\sqrt{3}
 \end{aligned}$$

ANSWER:  $-12x\sqrt{3}$

$$\begin{aligned}
 \text{b) } & (2\sqrt{3} - \sqrt{2})(2\sqrt{3} + 3\sqrt{2}) \quad \text{F.O.I.L.} \\
 & = 2\sqrt{3}(2\sqrt{3}) + 2\sqrt{3}(3\sqrt{2}) - \sqrt{2}(2\sqrt{3}) - \sqrt{2}(3\sqrt{2}) \\
 & = 4 \cdot 3 + 6\sqrt{6} - 2\sqrt{6} - 3 \cdot 2 \\
 & = 12 + 6\sqrt{6} - 2\sqrt{6} - 6 \\
 & = 6 + 4\sqrt{6}
 \end{aligned}$$

ANSWER:  $6 + 4\sqrt{6}$

6) Simplify (rationalize the denominator) (2 marks each):

$$\begin{aligned}
 \text{a) } & \frac{-42\sqrt[3]{48x^6}}{7\sqrt[3]{3x^2}} \\
 & = \frac{-42}{7} \cdot \frac{\sqrt[3]{48x^6}}{\sqrt[3]{3x^2}} = -6 \cdot \frac{\sqrt[3]{16x^4}}{\sqrt[3]{3x^2}} \\
 & = -6 \cdot \frac{\sqrt[3]{8 \cdot 2 \cdot x^3 \cdot x}}{\sqrt[3]{3x^2}} \\
 & = -6 \cdot 2 \cdot x \sqrt[3]{2x} \\
 & = -12x\sqrt[3]{2x}
 \end{aligned}$$

ANSWER:  $-12x\sqrt[3]{2x}$

$$\begin{aligned}
 \text{b) } & \frac{-x\sqrt{3}}{3\sqrt{2x}} \times \frac{\sqrt{2x}}{\sqrt{2x}} \\
 & = \frac{-x\sqrt{6x}}{3 \cdot 2x} \\
 & = \frac{-x\sqrt{6x}}{6x} \\
 & = \frac{-\sqrt{6x}}{6}
 \end{aligned}$$

ANSWER:  $\frac{-\sqrt{6x}}{6}$

$$\begin{aligned}
 \text{c) } & \frac{(1-\sqrt{3})(\sqrt{3}-2)}{(\sqrt{3}+2)(\sqrt{3}-2)} \quad \text{F.O.I.L.} \\
 & = \frac{\sqrt{3} - 2 - 3 + 2\sqrt{3}}{3 - 2\sqrt{3} + 2\sqrt{3} - 4} \\
 & = \frac{3\sqrt{3} - 5}{3 - 4} = \frac{3\sqrt{3} - 5}{-1} = -3\sqrt{3} + 5
 \end{aligned}$$

ANSWER:  $-3\sqrt{3} + 5$

or  $5 - 3\sqrt{3}$

isolate radical first!

7) Solve and check (2 marks each):

a)  $3\sqrt{9-x} + 12 = -18$   
-12 -12

$$\frac{3\sqrt{9-x}}{3} = \frac{-30}{3}$$

$$(\sqrt{9-x})^2 = (-10)^2$$

$$9-x = 100$$

$$-x = 91$$

$$x = -91$$

ANSWER(S):

no solution

CHECK(S):

$$3\sqrt{9-(-91)} + 12 = -18$$

$$3\sqrt{9+91} + 12 = -18$$

$$3\sqrt{100} + 12 = -18$$

$$3(10) + 12 = -18$$

$$30 + 12 = -18$$

$$42 \neq -18$$

X

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

$$(\sqrt{2y-3})^2 = (9)^2$$

$$2y-3 = 81$$

$$+3 +3$$

$$2y = 84$$

$$\frac{2y}{2} = \frac{84}{2}$$

$$y = 42$$

ANSWER(S):

y = 42

CHECK(S):

$$\sqrt{2(42)-3} - 7 = 2$$

$$\sqrt{84-3} - 7 = 2$$

$$\sqrt{81} - 7 = 2$$

$$9 - 7 = 2$$

$$2 = 2$$

$$2 = 2$$

✓

9) Solve and check (2 marks):  $\sqrt{10x-4} = 3\sqrt{x}$ 

$$(\sqrt{10x-4})^2 = (3\sqrt{x})^2$$

$$10x-4 = 9x$$

$$-9x + 4 = -9x + 4$$

$$x = 4$$

CHECK(S):

$$\sqrt{10(4)-4} = 3\sqrt{4}$$

$$\sqrt{40-4} = 3 \cdot 2$$

$$\sqrt{36} = 6$$

$$6 = 6$$

✓

ANSWER(S):

x = 4

10) The volume of a sphere is  $V = \frac{4}{3}\pi r^3$ . If the volume of a sphere is  $36\text{cm}^3$ , what is the radius? (answer in exact form) (3 marks)

$$(36)^{\times 3} = \left(\frac{4}{3}\pi r^3\right)^{\times 3}$$

$$\frac{108}{4\pi} = \frac{4\pi r^3}{4\pi}$$

$$\frac{27}{\pi} = r^3$$

$$\sqrt[3]{r^3} = \sqrt[3]{\frac{27}{\pi}}$$

$$r = \frac{\sqrt[3]{27}}{\sqrt[3]{\pi}}$$

$$r = \frac{3}{(\sqrt[3]{\pi})^1} \times \frac{(\sqrt[3]{\pi})^2}{(\sqrt[3]{\pi})^2} = \frac{3\sqrt[3]{\pi^2}}{\sqrt[3]{\pi^3}} = \frac{3\sqrt[3]{\pi^2}}{\pi}$$

to get the radical out of the denominator!

SENTENCE ANSWER:

The radius has an exact length of  $\frac{3\sqrt[3]{\pi^2}}{\pi}$  cm

