

Name: Key

Problem Set 5.3

1 - 6] Simplify each expression.

$$1) 4^{\frac{3}{2}} = \sqrt{4}^3 = 2^3 = \boxed{8}$$

$$2) 8^{\frac{2}{3}} = \frac{1}{8^{\frac{2}{3}}} = \frac{1}{\sqrt[3]{8}^2} = \frac{1}{2^2} = \boxed{\frac{1}{4}}$$

$$3) (2m)^4 \cdot (27m^3)^{\frac{2}{3}}$$
$$2^4 m^4 \cdot 27^{\frac{2}{3}} m^2$$
$$16m^4 \cdot 9m^2$$
$$\boxed{144m^6}$$

$$\sqrt[3]{24} = \sqrt[3]{8} \sqrt[3]{3} = 2\sqrt[3]{3}$$

$$4) 8\sqrt[3]{24} - 5\sqrt[3]{81}$$
$$\downarrow \quad \quad \quad \swarrow$$
$$8 \cdot 2\sqrt[3]{3} - 5 \cdot 3\sqrt[3]{3}$$
$$16\sqrt[3]{3} - 15\sqrt[3]{3}$$
$$\boxed{\sqrt[3]{3}}$$

$$5) \frac{8}{16^{\frac{5}{2}}} = \frac{8}{\sqrt{16}^5} = \frac{8}{4^5} = \frac{8}{1024} = \boxed{\frac{1}{128}}$$

$$6) \frac{9}{9^{-3}} = 9^{1-(-3)} = 9^4 = \boxed{6561}$$

$$7) p^{\frac{2}{3}} \cdot p^{\frac{5}{2}} = p^{2\frac{2}{3} + \frac{5}{2}} = \boxed{p^{19/6}}$$

$$8) \frac{r^{\frac{1}{2}}}{r^{\frac{6}{7}}} = r^{1/2 - 6/7} = r^{-5/14}$$
$$= \boxed{\frac{1}{r^{5/14}}}$$

$$\boxed{\sqrt[6]{p^{19}} = p^3 \sqrt[6]{p}}$$

9 - 14] Evaluate the following expressions. You may leave your answers as simplified radicals or simplified rational expressions if they cannot be simplified any further.

$$9) 8^{2/3} = \sqrt[3]{8^2} = \boxed{2^2 = 4}$$

$$10) (\sqrt[4]{16})^{-7} = 2^{-7} = \frac{1}{2^7} = \boxed{\frac{1}{128}}$$

$$11) \sqrt[3]{108} \cdot \sqrt[3]{4} = \sqrt[3]{432}$$

or

$$\sqrt[3]{216} \sqrt[3]{2} = \boxed{6\sqrt[3]{2}}$$

$$= \sqrt[3]{27} \sqrt[3]{16}$$

$$= 3\sqrt[3]{16}$$

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

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

$$= \boxed{6\sqrt[3]{2}}$$

$$12) 25\sqrt[3]{4} - 6\sqrt[3]{4} = \boxed{19\sqrt[3]{4}}$$

$$13) 12\sqrt[4]{2} - 7\sqrt[4]{512}$$

$$12\sqrt[4]{2} - 7\sqrt[4]{256} \sqrt[4]{2}$$

$$12\sqrt[4]{2} - 7 \cdot 4\sqrt[4]{2}$$

$$12\sqrt[4]{2} - 28\sqrt[4]{2}$$

$$\boxed{-16\sqrt[4]{2}}$$

$$14) (\sqrt[3]{5^2} \cdot \sqrt[3]{5^4})^{-3}$$

$$(5^{2/3} \cdot 5^{4/3})^{-3}$$

$$(5^{2/3} \cdot 5^{2/3})^{-3}$$

$$(5^{4/3})^{-3}$$

$$5^{-4} = \frac{1}{5^4}$$

$$= \boxed{\frac{1}{625}}$$