

**Unit 3—Exponents and Radicals Test Review**

Simplify the following expressions. Your answers should contain only positive exponents.

1.  $4a^{-3} \cdot 2a^2r^4$

2.  $\frac{18y^{-5}}{9y^2}$

3.  $(3x^{-3})^{-3}$

4.  $a^5 \times a^{-2}$

5.  $\frac{p}{p^{-3}}$

6.  $\left(\frac{x^2}{2y^{-3}}\right)^{-2}$

Simplify each radical expression.

7.  $4\sqrt{32x^3}$

8.  $\sqrt[3]{54m^5}$

9.  $-3\sqrt{45}$

10.  $\sqrt{120}$

11.  $\sqrt{81}$

12.  $\sqrt{324x^3y^4}$

13.  $3\sqrt{56x^5y^2}$

14.  $\sqrt[3]{40x^3y^8}$

**Add or subtract. Simplify by combining like radical terms, if possible.**

15.  $\sqrt{75} - 5\sqrt{3}$

16.  $2\sqrt{45} - 9\sqrt{3} + 3\sqrt{20}$

17.  $\sqrt{7} + \sqrt{28} - \sqrt{63}$

**Multiply and simplify.**

18.  $4\sqrt{3}(5 + \sqrt{6})$

19.  $(5 + \sqrt{3})(5 - \sqrt{3})$

20.  $(-6\sqrt{12})(2\sqrt{3})$