Exponents and Radicals (Intermediate)

1. Which of the following expressions is equivalent to $\frac{a^7 b^6 c d^3}{a^5 b^7 c^4 d^2}$?

   A. $\frac{a^2 bcd}{b^6 c^4 d^2}$

   B. $\frac{a^2 d}{bc^3}$

   C. $a^{\frac{7}{5}} b^{\frac{6}{7}} c^{\frac{1}{4}} d^{\frac{3}{2}}$

   D. $a^{12} b^{13} c^5 d^5$

   E. $\frac{bc^3}{a^2 d}$

2. Which of the following is equivalent to $\left(\frac{1}{x^b}\right) + x^{-b}$?

   A. $1 - x^b$

   B. $1 + x^b - \frac{1}{x^b}$

   C. $1^x + \frac{1}{x^b}$

   D. $2x^b$

   E. $\left(\frac{2}{x^b}\right)$

3. For all nonzero $a, b,$ and $c,$ which of the following is equal to $\left(\frac{3a^{-2}b^3 c^0}{9a^3 b^{-4} c}\right)^{-3}$?

   A. $\frac{27c^3}{a^{15} b^{21}}$

   B. $\frac{27a^{15}}{b^{21} c^3}$

   C. $\frac{c^3}{27a^{15} b^{21}}$

   D. $\frac{a^{15} b^{21}}{27c^3}$

   E. $\frac{27a^{15} c^3}{b^{21}}$

4. Which of the following is equivalent to $(x + 3)^0$ whenever $x \neq -3$?

   A. $x + 3$

   B. 0

   C. 1

   D. 2

   E. 3

5. Which of the following is an equivalent form of
   $\sqrt[3]{h^2 g^{9b}}$, where $g > 0$ and $k > 0$?

   A. $h^{-1} g^{\frac{1}{3b}}$

   B. $h^{\frac{3}{2}} g^{\frac{1}{3b}}$

   C. $h^{-1} g^{3b}$

   D. $h^{\frac{2}{3}} g^{3b}$

   E. $h^{\frac{3}{2}} g^{3b}$

6. Which of the following expressions is equivalent to
   $(y + 4)^{-50}$?

   A. $-50y - 200$

   B. $\frac{1}{y^{50}} + \frac{1}{4^{50}}$

   C. $-y^{50} - 4^{50}$

   D. $\frac{1}{(y+4)^{50}}$

   E. $\frac{1}{(4y)^{50}}$

7. Which of the following is equivalent to $\sqrt[4]{x^2 + 6x + 9}$?
   A. $(x + 3)^4$
   B. $(x + 3)^2$
   C. $(x + 3)$
   D. $(x + 3)^{\frac{1}{2}}$
   E. $(x + 3)^{\frac{1}{4}}$

8. If $d, e,$ and f are positive integers such that $d^e = x$ and
   $f^e = y$, then $xy = $?
   A. $(df)^e$
   B. $(df)^{2e}$
   C. df^e
   D. df^{2e}
   E. $d^e f$

9. Which of the following is equivalent to the expression $(16m^2)^{\frac{1}{2}} + (8m^6)^{\frac{1}{3}} - 80^{\frac{1}{2}}$?

   A. $16m + \frac{8}{3}m^2 - 40$

   B. $16m + 2m^2 - 4\sqrt{5}$

   C. $4m + 2m^2 - 4\sqrt{5}$

   D. $4m + \frac{8}{3}m^2 - 40$

   E. $8m + \frac{8}{3}m^2 - 40$

10. Which of the following could be the value of $\sqrt{y^2}$ for some integer y ?

    A. -4

    B. -2

    C. $\frac{1}{3}$

    D. 4

    E. e

11. Which of the following expressions is equivalent to $(27y^8x^7)^{\frac{1}{3}}$, where $x \geq 0$ and $y \geq 0$?

    A. $3y^2x^{\frac{7}{3}}$

    B. $3y^{\frac{8}{3}}x^{\frac{7}{3}}$

    C. $9y^2x^{\frac{7}{3}}$

    D. $9y^{\frac{8}{3}}x^{\frac{7}{3}}$

    E. $27y^2x^{\frac{7}{3}}$

12. If $a > 0$ and $b > 0$, then which of the following expressions is equivalent to $\frac{28a^2b^4}{7ab^2}$?

    A. $4ab^2$
    B. $4a^3b^6$
    C. $4a^3b^8$
    D. $21ab^2$
    E. $35a^3b^6$

13. Which of the following is equivalent to the expression

$$9^{-\frac{1}{2}}\left((a^2)(a^4) - \frac{a^2 b^{14}}{ab^8} + c^{\frac{2}{3}}\right)?$$

A. $\dfrac{a^6 - ab^6 + \sqrt[3]{c^2}}{3}$

B. $\dfrac{a^6 - ab^6 + \sqrt{c^3}}{3}$

C. $\dfrac{a^8 - ab^6 + \sqrt[3]{c^2}}{3}$

D. $3a^6 - a^2 b^6 + \dfrac{2}{3}c$

E. $3a^8 - ab^6 + \sqrt[3]{c^2}$

14. What real value of m satisfies the equation $9^m = \dfrac{1}{81^{m+1}}$?

A. -2

B. $-\dfrac{2}{3}$

C. $-\dfrac{1}{6}$

D. $\dfrac{1}{6}$

E. $\dfrac{1}{2}$

15. Given $9^{\frac{3x+1}{x}} = 1$, $x = ?$

A. $-\dfrac{1}{2}$

B. $-\dfrac{1}{3}$

C. $\dfrac{1}{2}$

D. $\dfrac{1}{3}$

E. 1