

1. Express the number in the form  $\frac{a}{b}$ , where  $a$  and  $b$  are integers:

$$-3^0 + 2^{-2} + 27^{\frac{2}{3}}$$

A.  $\frac{41}{4}$

B.  $\frac{17}{2}$

C.  $\frac{21}{2}$

D.  $\frac{33}{4}$

E. None of the above

2. Simplify:

$$\frac{(3x^2y^{-3})^{-2}}{x^{-5}y}$$

A.  $-6xy^5$

B.  $\frac{xy^5}{9}$

C.  $\frac{1}{9x^7y^4}$

D.  $\frac{1}{9x^{14}y^4}$

E.  $\frac{xy^5}{6}$

3. Simplify:

$$(x + y)^2 - (x^2 + y^2)$$

A. 0

B.  $2y^2$

C.  $2xy$

D.  $2y^2 + 2xy$

E. None of the above

4. Which of the following polynomials has  $x - 1$  as a factor?

A.  $x^2 - 5x + 6$

B.  $x^2 - 2x - 3$

C.  $x^2 - 1$

D. There is more than one possible answer

E. None of the above

5. Simplify completely. Do not leave negative exponents in your answer.

$$x^2 + x^{-2}$$

A. 0

B. 1

C.  $\frac{x^2+1}{x^2}$

D.  $\frac{x^4+1}{x^2}$

E.  $x^2 + 1$

6. Simplify completely.

$$\frac{\frac{b}{a} - \frac{a}{b}}{\frac{b-a}{ab^3}}$$

A.  $b^2$

B.  $\frac{(b-a)^2}{a^2b^4}$

C.  $b^2(b-a)$

D.  $\frac{a+b}{ab}$

E.  $b^2(a+b)$

7. Solve the equation:

$$\frac{2}{x+5} - \frac{3}{2x+1} = \frac{5}{6x+3}$$

- A. There is one solution for  $x$ .  
It is less than  $-10$ .
- B. There is one solution for  $x$ .  
It is between  $-10$  and  $0$ .
- C. There is one solution for  $x$ .  
It is between  $0$  and  $10$ .
- D. There is one solution for  $x$ .  
It is greater than  $10$ .
- E. None of the above

8. Solve  $P + N = \frac{C+2}{C}$  for  $C$ .

- A.  $C = \frac{2}{P+N-1}$
- B.  $C = \frac{2}{P+N}$
- C.  $C = \frac{PN}{2}$
- D.  $C = \frac{2}{PN-1}$
- E.  $C = \frac{P+N}{2}$

9. Solve the equation:

$$(x+4)^2 - 8 = 0$$

- A. There are two solutions for  $x$ .  
One is positive and one is negative.
- B. There are two solutions for  $x$ .  
One is positive and one is zero.
- C. There are two solutions for  $x$ .  
One is negative and one is zero.
- D. There is one solution for  $x$ .  
It is zero.
- E. None of the above

10. Solve the equation and simplify your answer completely.

$$\frac{x}{3x+1} = \frac{x-1}{2x+3}$$

A.  $x = 1, 4$

B.  $x = -\frac{5}{2} \pm \frac{\sqrt{21}}{2}$

C.  $x = \frac{5}{2} \pm \frac{\sqrt{29}}{2}$

D. All real numbers except

$$x = -\frac{1}{3}, -\frac{3}{2}$$

E. There are no real solutions for  $x$

11. Solve for  $x$  and choose the answer that best describes the solution(s).

$$x = 4 + \sqrt{4x - 19}$$

A. There is one solution.  
It is negative.

B. There is one solution.  
It is positive.

C. There are two solutions.  
Both are positive.

D. There are two solutions.  
One is positive and one is negative.

E. There is no solution for  $x$ .

12. Which of the following statements is/are true?

- I.  $|x| = -2$ , when  $x = -2, 2$   
II.  $|x| > 2$ , when  $-2 < x < 2$   
III.  $|x| < 0$  for all real numbers

A. I only

B. II only

C. III only

D. All are true

E. None are true

13. An electrician and his apprentice make \$55 and \$20 an hour, respectively. If they bill a customer \$735 for labor on a job, and the apprentice worked 3 hours fewer than the electrician, how many hours did the apprentice work?

*A. Less than 8 hours*  
*B. Between 8 and 10 hours*  
*C. Between 10 and 12 hours*  
*D. Between 12 and 14 hours*  
*E. More than 14 hours*

14. Two trains leave a station at 11:00am. One train travels north at a rate of 75 mph and another travels east at a rate of 60 mph. Assuming the trains do not stop, about how many minutes will it take for the trains to be 150 miles apart?

*A. Less than half an hour*  
*B. Between half an hour and an hour*  
*C. Between an hour and 1.5 hours*  
*D. Between 1.5 hours and 2 hours*  
*E. More than 2 hours*

15. A paper cup in the shape of a cone is to have a height of 3 inches. Find the radius  $r$  of the cone that will result in a surface area of  $6\pi \text{ in}^3$ , using the formula for the surface area of a cone  $S = \pi r\sqrt{r^2 + h^2}$ .

*A. There are four possible solutions.*  
*B. There are two possible solutions.*  
*C. There is one solution.  
It is between 0 and 1.*  
*D. There is one solution.  
It is between 1 and 2.*  
*E. There is one solution.  
It is between 2 and 3.*