

1. Let f be a function for which $f\left(\frac{x}{3}\right) = x^2 + x + 1$. Find the sum of all values for z for which $f(3z) = 7$

- A. $-\frac{1}{3}$
- B. $-\frac{1}{9}$
- C. 0
- D. $\frac{5}{9}$
- E. $\frac{5}{3}$

2. The lines $x = \frac{y}{4} + a$ and $y = \frac{x}{4} + b$ intersect at $(1, 2)$ what is $a + b$?

- A. 0
- B. $\frac{3}{4}$
- C. 1
- D. 2
- E. $\frac{9}{4}$

3. If x cows give $x + 1$ cans of milk in $x + 2$ days, how many days will it take $x + 3$ cows to give $x + 5$ cans of milk?

- A. $\frac{x(x+2)(x+5)}{(x+1)(x+3)}$
- B. $\frac{x(x+1)(x+5)}{(x+2)(x+3)}$
- C. $\frac{(x+1)(x+3)(x+5)}{x(x+2)}$
- D. $\frac{(x+1)(x+3)}{x(x+2)(x+5)}$
- E. None of These

4. For how many real values of x is $\sqrt{120 - \sqrt{x}}$ an integer?

- A. 3
- B. 6
- C. 9
- D. 10
- E. 11

5. If $1 - \frac{4}{x} + \frac{4}{x^2} = 0$ then $\frac{2}{x} =$

- A. -1
- B. 1
- C. 2
- D. -1 or 2
- E. -1 or -2

6. If $\frac{m}{n} = \frac{4}{3}$ and $\frac{r}{l} = \frac{9}{14}$ then value of $\frac{3mr - nt}{4nt - 7mr} =$

- A. $-\frac{11}{2}$
- B. $-\frac{11}{14}$
- C. $-\frac{5}{4}$
- D. $\frac{11}{14}$
- E. $-\frac{2}{3}$

7. The number of distinct points common to the graphs of $x^2 + y^2 = 9$ and $y^2 = 9$ is:

- A. Infinitely Many
- B. four
- C. two
- D. one
- E. none

8. When x^5 and $x + \frac{1}{x}$ and $1 + \frac{2}{x} + \frac{3}{x^3}$ are multiplied, then the product is a polynomial of degree

- A. 2
- B. 3
- C. 6
- D. 7
- E. 8

9. Suppose that a and b are nonzero real numbers, and that the equation $x^2 + ax + b = 0$ has solutions a and b . The pair (a, b) is

- A. (-2, 1)
- B. (-1, 2)
- C. (1, -2)
- D. (2, -1)
- E. (4, 4)

10. For which values of k does the equation $\frac{x-1}{x-2} = \frac{x-k}{x-6}$

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

11. Three men, Alpha, Beta, and Gamma, working together do a job in 6 hours less time than Alpha alone, in 1 hour less time than Beta alone, and in one-half the time needed by Gamma when working alone. Let h be the number of hours needed by Alpha and Beta working together to do the job. Then $h =$

- A. $\frac{5}{2}$
- B. $\frac{3}{2}$
- C. $\frac{4}{3}$
- D. $\frac{5}{4}$
- E. $\frac{3}{4}$

12 If $g(x) = 1 - x^2$ and $f(g(x)) = \frac{1-x^2}{x^2}$ when $x \neq 0$ then $f\left(\frac{1}{2}\right) =$

- A. $\frac{3}{4}$
- B. 1
- C. 3
- D. $\frac{\sqrt{2}}{2}$
- E. $\sqrt{2}$

13. If $\frac{1}{x} - \frac{1}{y} = \frac{1}{z}$ then $z =$

- A. $y - x$
- B. $x - y$
- C. $\frac{y - x}{xy}$
- D. $\frac{xy}{y - x}$
- E. $\frac{xy}{x - y}$

14. If $y = 2x$ and $z = 2y$ then $x + y + z =$

- A. x
- B. $3x$
- C. $5x$
- D. $7x$
- E. $9x$

15. If x and y are non-zero real numbers such that: $|x| + y = 3$ and $|x|y + x^3 = 0$, then the integer nearest to $x - y$ is

- A. -3
- B. -1
- C. 2
- D. 3
- E. 5