1. Find a linear function, which passes through the points (-3,1) and (2, -4).

a. $f(x) = x + 2$ b. $f(x) = -x - 2$ c. $f(x) = -x + 6$ d. $f(x) = x - 2$
e. not given

2. If the functions $f$, g, and h are defined by $f(x) = x^3$, $g(x) = x - 2$, *and* $h(x) = \frac{x}{2}$, then $f(g(h(8))) =$

a. 0 b. 4 c. 8 d. 27 e. not given

3. Which one of the following relations is NOT a function?

a. $\{(x, y) : y^2 = x + 4 \text{ and } x > -4\}$ b. $\{(x, y) : y = x^2 + 2\}$
c. $\{(x, y) : y^2 = x + 4 \text{ and } y > 0\}$ d. $\{(x, y) : x^2 + y^2 = 25 \text{ and } xy > 0\}$
e. not given

4. If $f(x) = e^x$ and $g(x) = \ln x$, find $f(g(x + 1)) =$

a. x b. x + 1 c. e d. $e^{x+1}$ e. not given

5. Which of the following are odd?
I. $f(x) = x^3 - 4x$ II. $f(x) = x - 4^3$ III. $f(x) = \sin x$
IV. $f(x) = \cos x$ V. $f(x) = g(x) \bullet h(x)$, where g is even and h is odd.

a. I, II, III, IV, and V. b. I, and III only c. I, III, and V only
d. II, and III only e. not given

6. Find the domain of $y = \sqrt{x^3 - 4x^2 - x + 4}$

a. $x \le -2$ or $1 \le x \le 2$ b. $-2 \le x \le 1$ or $x \ge 2$ c. $x \le -1$ or $1 \le x \le 4$
d. $-1 \le x \le 1$ or $x \ge 4$ e. not given

7. If $f(x) = x^2 + 2x + 1$ and g(x) = x- 1, find $f(g(x)) =$

a. $x^2$ b. $x^2 + 4x + 4$ c. $x^3 + x^3 - x - 1$ d. $x^2 + 2x$ e. not given

8. Given the linear function g where $g(2) = 3$ and $g^{-1}(6) = 8$. Find the numerical value of $g(20) - g^{-1}(7)$.

a. -1 b. 2 c. 7 d. 12 e. not given

9. If $f(x) = 5x + 3$ and $g(x) = 3x + k$, the value of k such that $f(g(x)) = g(f(x))$ is

a. $\frac{3}{2}$ b. $\frac{2}{3}$ c. -2 d. -1 e. not given

10. Find x when $f(x) = \frac{x}{x-3}$ and $f^{-1}(x) = 6$.

a. 2 b. 3 c. 4 d. 6 e. not given

11. Given $f(x) = x^4 - 4x^3 + 6x^2 - 4x$. If $f(1 + 2i) = a + bi$ where $i = \sqrt{-1}$, then a + b =

a. 5 b. 10 c. 15 d. 20 e. not given

12. If $f(x) = 1 + \frac{1}{x}$, find $f(f(f(x)))$.

a. $\frac{x+1}{x}$ b. $\frac{2x+1}{x+1}$ c. $\frac{3x+2}{2x+1}$ d. $\frac{4x+3}{3x+2}$ e. not given

13. If $f(x) = 3x^3 - 2x^2 + ax + b$ and $f(2) = 26$ and $f(-1) = -4$, the sum of a + b is

a. 10 b. 9 c. 8 d. 7 e. not given

14. If $f(x) = 2x^2 - 2$ and g(x) = 3x + 1. Find the sum of all the values of x if $f(g(x)) = 6$.

a. $\frac{2}{3}$ b. $\frac{1}{3}$ c. $\frac{-1}{3}$ d. $\frac{-2}{3}$ e. not given

15. If $f(x) = x^x$, then $f\left(\sqrt{2}\right) =$ State your answer as a decimal rounded to the nearest tenth.

a. 1.4 b. 1.5 c. 1.6 d. 2.0 e. not given

16. In the quadratic function $ax^2 + bx + c = f(x)$, $f\left(\frac{2}{3}\right) = 0$, $f(-4) = 0$ and $f(0) = -8$. The sum of a + b + c is

a. -15 b. -12 c. 5 d. 8 e. not given

17. Which one of the following is an even function?

a. $f(x) = 2 \sin x$ b. $f(x) = 3^x$ c. $f(x) = \sqrt[3]{x}$
d. $f(x) = x^4 + 5x^2 - 3$ e. not given

18. If $f(x) = 2^x + 1$, $f^{-1}(7) =$

a. 2.4 b. 2.6 c. 2.8 d. 3.0 e. not given

19. If the roots of the polynomical $f(x)$ are 3 and 2, what are the roots of $f\left(\frac{x}{2}\right)$?

a. 3 and 2 b. 6 and 4 c. 1.5 and 1 d. 8 and 12 e. not given

20. Find the range , R, of the function $f(x) = \frac{x}{|x|}$. The domain, D, consists of the set of non-zero real numbers.

a. R = { 1, 0 } b. R = { -1, 1} c. (1, -1, 0 ) d. All positive integers
e. not given

21. If $f(x) = \log_2 x$, *then* $f(\frac{2}{x}) + f(x) =$

a. $\log(\frac{2}{x}) + \log_2 x$ b. 1 c. $\log_2\left(\frac{2+x^2}{x}\right)$ d. $\log(\frac{2}{x}) \bullet \log_2 x$
e. not given

22. If the functions $f$ and g are defined by $f(x, y) = x^2 + 2y^2 - y$ and $g(h) = h + 7$, what is $f(3, g(-2))$?

a. 24 b. 54 c. 59 d. 64 e. not given

23. Find k such that -3 is a zero of $f(x) = x^5 + 3x^4 + 3x^3 + kx^2 - 3x - 9$

a. 9 b. 0 c. -9 d. -61 e. not given

24. If $f(n)$ is defined as the negative reciprocal of $f(n-1)$ and $f(20)=2$ then $f(0) =$

a. 2 b. -2 c. $\frac{1}{2}$ d. $\frac{-1}{2}$ e. not given

25. For all real numbers x, the function $f(x)$ satisfies $2f(x) + f(1 - x) = x^2$. Find $f(5)$.

a. $\frac{34}{3}$ b. $\frac{10}{3}$ c. $\frac{7}{3}$ d. $\frac{5}{3}$ e. not given

26. In the function $f(x) = \frac{kx+m}{nx+j}$ with $x \neq \frac{-j}{n}$ and n and j not both 0, what restrictions must be made for $f^{-1}$ to exist?

a. $x \neq 0$ b. $x \neq \frac{n}{k}$, n and k not both 0 c. $x \neq \frac{k}{n}$, n & k not both 0
d. $nk \neq m$ e. not given

27. If $f(x) = 2x + 5$ and $|f(x) - f(2)| < 1$, then $|x - 2| < L$. The smallest value of L is

a. 7 b. 1 c. 1.5 d. 0.5 d. not given

28. Let $f(t) = \frac{t}{t-1}, t \neq 1$. If $y = f(x)$, then x can be expressed as

a. $f(\frac{1}{y})$ b. $-f(y)$ c. $f(y)$ d. $f(-y)$ e. not given

29. If n is a natural number, $f(n + 1) = \frac{2f(n)+1}{2}$ and $f(1) = 2$. Find $f(101) =$

a. 52.5 b. 52 c. 51.5 d. 51 e. not given

30. If $x_0 = 3$ and $x_{n+1} = x_n\sqrt{x_n + 1}$, then $x_3 =$ State your answer to the nearest tenth.

a. 31.7 b. 44.9 c. 65.2 d. 173.9 e. not given