

Function Evaluation

Determine if the given relation is a function.

1) $(2, 4)(3, -7)(6, 10)$

yes

2) $(-1, 8)(4, -7)(-1, 6)(0, 0)$

no

Determine if the given equation is a function.

3) $y = 14 - \frac{1}{3}x$

yes, linear

4) $y = \sqrt{3x^2 + 1}$

yes, each x gives one y

5) $y^4 - x^2 = 16$

no

$y^4 = x^2 + 16$

if $x=0$, $y^4=16$ $y=2$ $y=-2$

Evaluate each function.

6) $g(n) = |n + 1| - 2$; Find $g(8)$

$|8+1|-2$
 $|9|-2 = 7$

7) $p(n) = n^2 - 3$; Find $p(2)$

$2^2 - 3 = 1$

8) $g(x) = -5^{x-2}$; Find $g(2)$

$-5^{2-2} = -1$

9) $w(x) = 4^x - 2$; Find $w(-2)$

$4^{-2} - 2 = \frac{1}{16} - 2 = -\frac{31}{16}$

10) $h(x) = |x - 2|$; Find $h(-2)$

$|-2-2| = 4$

11) $k(n) = |n - 1| + \frac{1}{3}$; Find $k\left(-\frac{5}{3}\right)$

$\left|-\frac{5}{3}-1\right| + \frac{1}{3} = \left|-\frac{8}{3}\right| + \frac{1}{3} = 3$

12) $f(x) = x^2 - \frac{5}{4}x$; Find $f\left(\frac{1}{4}\right)$

$\left(\frac{1}{4}\right)^2 - \frac{5}{4}\left(\frac{1}{4}\right) = \frac{-4}{16} = -\frac{1}{4}$

13) $h(n) = -\frac{1}{2}n^2 - \frac{1}{2}$; Find $h(-2)$

$-\frac{1}{2}(-2)^2 - \frac{1}{2} = -2 - \frac{1}{2} = -\frac{5}{2}$

14) $f(x) = x^2 + 1$; Find $f(x - 2)$

$(x-2)^2 + 1$
 $x^2 - 4x + 4 + 1$

$x^2 - 4x + 5$

15) $f(a) = a^2 - 2a$; Find $f(a - 4)$

$(a-4)^2 - 2(a-4)$
 $a^2 - 8a + 16 - 2a + 8$

$a^2 - 10a + 24$

$$16) g(n) = -3n^3 - 5; \text{ Find } g(n-4) \frac{n^3 - 8n^2 + 16n - 4n^2 + 32n - 64}{n^3 - 12n^2 + 48n - 64}$$

$$-3(n-4)^3 - 5$$

$$-3(n-4)(n^2 - 8n + 16) - 5$$

$$-3(n^3 - 12n^2 + 48n - 64) - 5$$

$$-3n^3 + 36n^2 - 144n + 192 - 5 = -3n^3 + 36n^2 - 144n + 187$$

$$17) w(t) = t^2 - t; \text{ Find } w(t+2)$$

$$(t+2)^2 - (t+2)$$

$$t^2 + 4t + 4 - t - 2$$

$$t^2 + 3t + 2$$

$$18) f(t) = t^3 - 2t^2; \text{ Find } f(1-z)$$

$$(1-z)^3 - 2(1-z)^2$$

$$(1-z)(1-2z+z^2) - 2(1-2z+z^2)$$

$$1-2z+z^2-z+2z^2-z^3-2+4z-2z^2$$

$$-1+z+z^2-z^3$$

$$19) w(n) = -2n^3 + n; \text{ Find } w(n+4)$$

$$-2(n+4)^3 + (n+4)$$

$$-2(n+4)(n^2+8n+16) + n+4$$

$$-2(n^3+12n^2+48n+64) + n+4$$

$$-2n^3-24n^2-96n-128+n+4$$

$$-2n^3-24n^2-95n-124$$

$$20) h(n) = n^2 - 4; \text{ Find } h(b-1)$$

$$(b-1)^2 - 4$$

$$b^2 - 2b + 1 - 4$$

$$b^2 - 2b - 3$$

$$21) g(x) = x^3 + x^2; \text{ Find } g\left(\frac{x}{2}\right)$$

$$\left(\frac{x}{2}\right)^3 + \left(\frac{x}{2}\right)^2$$

$$\frac{x^3}{8} + \frac{x^2}{4}$$

$$22) p(n) = \left|3 - \frac{1}{3}n\right|; \text{ Find } p\left(\frac{4n}{3}\right)$$

$$\left|3 - \frac{1}{3}\left(\frac{4n}{3}\right)\right| = \left|3 - \frac{4n}{9}\right| = \left|\frac{27-4n}{9}\right|$$

$$23) g(n) = -\frac{4}{3} \cdot 5^{2n}; \text{ Find } g\left(-n - \frac{4}{3}\right)$$

$$-\frac{4}{3} \cdot 5^{2(-n - \frac{4}{3})}$$

$$-\frac{4 \cdot 5^{-2n - \frac{8}{3}}}{3} = \frac{-4 \cdot 5^{-\frac{6n-8}{3}}}{3}$$

$$24) w(t) = -\frac{3}{2} \cdot 2^t; \text{ Find } w\left(\frac{t}{2}\right)$$

$$-\frac{3}{2} \cdot 2^{t/2} = \frac{-3 \cdot 2^{t/2}}{2}$$

$$25) h(x) = -\frac{4}{3}x^2 - \frac{7}{4}; \text{ Find } h\left(n - \frac{3}{2}\right)$$

$$-\frac{4}{3}\left(n - \frac{3}{2}\right)^2 - \frac{7}{4}$$

$$-\frac{4}{3}\left(n^2 - 3n + \frac{9}{4}\right) - \frac{7}{4}$$

$$-\frac{4}{3}n^2 + 4n - 3 - \frac{7}{4} = \frac{-\frac{4}{3}n^2 + 4n - \frac{19}{4}}{1}$$

Compute the difference quotient for the given function.

$$26) f(x) = 3 - 6x \quad \frac{3 - 6(x+h) - (3 - 6x)}{h}$$

$$\frac{3 - 6x - 6h - 3 + 6x}{h} = \boxed{-6}$$

$$27) g(t) = t^2 - 2t \quad \frac{(x+h)^2 - 2(x+h) - (x^2 - 2x)}{h}$$

$$= \frac{x^2 + 2hx + h^2 - 2x - 2h - x^2 + 2x}{h}$$

$$= \frac{h(2x + h - 2)}{h} = \boxed{2x + h - 2}$$

$$28) h(y) = 3y^2 - 4y + 2 \quad \frac{3(x+h)^2 - 4(x+h) + 2 - (3x^2 - 4x + 2)}{h}$$

$$\frac{3(x^2 + 2hx + h^2) - 4x - 4h + 2 - 3x^2 + 4x - 2}{h}$$

$$\frac{3x^2 + 6hx + 3h^2 - 4x - 4h + 2 - 3x^2 + 4x - 2}{h}$$

$$\frac{h(6x + 3h - 4)}{h} = \boxed{6x + 3h - 4}$$

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Evaluate each function.

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14) $f(x) = x^2 + 1$; Find $f(x - 2)$

15) $f(a) = a^2 - 2a$; Find $f(a - 4)$

16) $g(n) = -3n^3 - 5$; Find $g(n - 4)$

17) $w(t) = t^2 - t$; Find $w(t + 2)$

18) $f(t) = t^3 - 2t^2$; Find $f(1 - z)$

19) $w(n) = -2n^3 + n$; Find $w(n + 4)$

20) $h(n) = n^2 - 4$; Find $h(b - 1)$

21) $g(x) = x^3 + x^2$; Find $g\left(\frac{x}{2}\right)$

22) $p(n) = \left|3 - \frac{1}{3}n\right|$; Find $p\left(\frac{4n}{3}\right)$

23) $g(n) = -\frac{4}{3} \cdot 5^{2n}$; Find $g\left(-n - \frac{4}{3}\right)$

24) $w(t) = -\frac{3}{2} \cdot 2^t$; Find $w\left(\frac{t}{2}\right)$

25) $h(x) = -\frac{4}{3}x^2 - \frac{7}{4}$; Find $h\left(n - \frac{3}{2}\right)$

Compute the difference quotient for the given function.

26) $f(x) = 3 - 6x$

27) $g(t) = t^2 - 2t$

28) $h(y) = 3y^2 - 4y + 2$