

1. The graph of a function f is shown below. Find the following:

a) $f(1)$ and $f(5)$

$$f(1) = 3 \quad f(5) = -0.7$$

b) the domain of f

$$\text{Dom}(f) = [0, 7]$$

c) the range of f

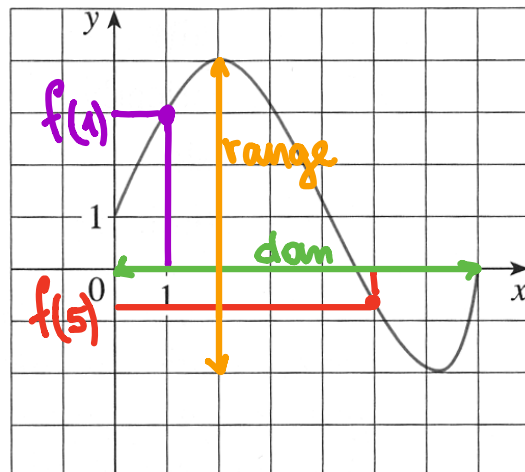
$$\text{E}(f) = [-2, 4]$$

d) For which value of x is $f(x) = 4$?

$$x = 2$$

e) Where is f increasing?

$$(0, 2) \cup (6.1, 7)$$



2. Let $f(x) = 3x^2 - x + 2$. Find and simplify the following expressions. Are (b) and (c) different?

(a) $f(2)$

$$f(2) = 3 \cdot 2^2 - 2 + 2 = 12$$

(b) $f(a^2)$

$$f(a^2) = 3(a^2)^2 - a^2 + 2 = 3a^4 - a^2 + 2$$

(c) $[f(a)]^2$

$$(f(a))^2 = (3a^2 - a + 2)^2 = 9a^4 + a^2 + 4 - 6a^3 + 12a^2 - 4a$$

$$(d) \frac{f(a+h) - f(a)}{h} = \frac{3(a+h)^2 - (a+h) + 2 - 3a^2 + a - 2}{h} =$$

$$= \frac{\cancel{3a^2} + 6ah + 3h^2 - \cancel{a} - h + \cancel{2} - \cancel{3a^2} + \cancel{a} - \cancel{2}}{h} = \frac{6ah + 3h^2 - h}{h} =$$

$$= \frac{\cancel{h}(6a + 3h - 1)}{\cancel{h}} = 6a + 3h - 1$$

3. Determine whether each of the following functions is even, odd, neither even nor odd:

(a) $f(x) = \cos(x) + x^6$ even

$$f(-x) = \cos(-x) + (-x)^6 = \cos x + x^6$$

$f(x)$ is even if $f(-x) = f(x)$
 $f(x)$ is odd if $f(-x) = -f(x)$

(b) $f(x) = \sin(x) - x^3$ odd

$$f(-x) = \sin(-x) - (-x)^3 = -\sin x + x^3$$

(c) $f(x) = x - x^2$ neither even nor odd

$$f(-x) = -x - (-x)^2 = -x - x^2$$

4. Find the domain of each of the following functions. Use interval notation.

(a) $f(x) = \frac{1}{x^2 - 16}$ (rational function)

$$x^2 - 16 \neq 0$$

$$x^2 \neq 16 \Rightarrow x \neq \pm 4$$

$$\text{Dom}(f) = (-\infty, -4) \cup (4, \infty)$$

(b) $g(x) = \ln(\underbrace{x-4}_>0)$

$$x - 4 > 0 \Rightarrow x > 4$$

$$\text{Dom}(g) = (4, \infty)$$

5. Graph the piecewise defined function.

$$f(x) = \begin{cases} x + 1 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$$

