

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

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

$$f(1) = 3, f(5) = -1.6$$

b) the domain of f

$$[0, 7]$$

c) the range of f

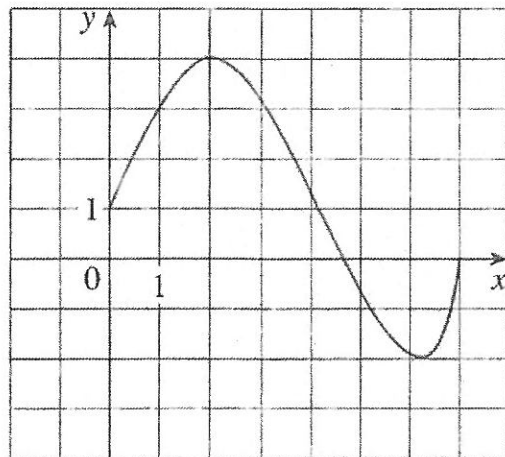
$$[-2, 4]$$

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

$$x = 2$$

e) Where is f increasing?

$$[0, 2] \cup [6.25, 7]$$



2. Let $f(x) = 3x^2 - x + 2$. Find and simplify the following expressions.

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

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

(c) $[f(a)]^2 = (3a^2 - a + 2)^2 = 9a^4 - 6a^3 + (12a^2 + (-a)^2) - 4a + 4$
 $= 9a^4 - 6a^3 + 13a^2 - 4a + 4$

(d) $\frac{f(2+h) - f(2)}{h} = \frac{3(2+h)^2 - (2+h) + 2 - (3(2)^2 - 2 + 2)}{h}$
 $= \frac{3(4+4h+h^2) - 2 - h + 2 - 12 + 2 - 2}{h} = \frac{11h + 3h^2}{h} = 11 + 3h$

(e) $\frac{f(a+h) - f(a)}{h} = \frac{3(a^2 + 2ah + h^2) - (a+h) + 2 - (3a^2 - a + 2)}{h}$
 $= \frac{6ah + 3h^2 - h}{h} = 6a - 1 + 3h$

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

1. $f(x) = \frac{1}{x^4 - 16}$ Need $x^4 - 16 \neq 0$
 $x^4 \neq 16$
 $x \neq \pm 2$

$$(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$$

2. $f(x) = \sqrt{x} + \sqrt{11-x}$ Need $x \geq 0$ $11-x \geq 0$
 $11 \geq x$

$$[0, 11]$$

3. $g(x) = \ln(x-4)$ Need $x-4 > 0$
 $x > 4$

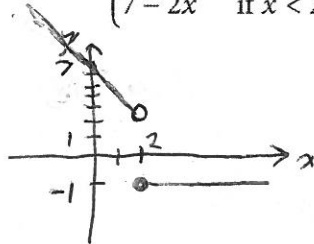
$$(4, \infty)$$

4. $h(x) = \frac{1}{\sqrt{x^2 - 5x - 6}}$ Need $x^2 - 5x - 6 \geq 0$
 $(x-6)(x+1) \geq 0$

So either $x-6 > 0, x+1 > 0$ i.e. $x > 6$
or $x-6 < 0, x+1 < 0$ i.e. $x < -1$
or $x=6$ or $x=-1$

4. Graph each of the following piecewise defined functions.

a) $f(x) = \begin{cases} -1 & \text{if } x \geq 2 \\ 7-2x & \text{if } x < 2 \end{cases}$



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

