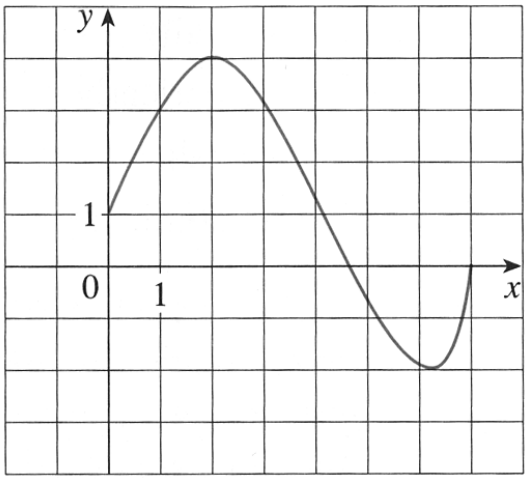
1. The graph of a function f is shown below. Find the following:



a) $f(1)$ and $f(5)$ $f(1) = 2$

$f(5) \approx -0.7$

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?

either $[0, 2]$ or $[6.2, 7]$

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

(a) $f(2)$

$12 - 2 + 2 = 12$

(b) $f(a^2)$

$3a^4 - a^2 + 2$

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

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

$= \boxed{9a^4 - 6a^3 + 13a^2 - 4a + 4}$

(d) $\dfrac{f(2+h) - f(2)}{h}$

$= \dfrac{[3(4 + 4h + h^2) - (2 + h) + 2] - [3 \cdot 4 - 2 + 2]}{h} = 11 + 3h$

(e) $\dfrac{f(a+h) - f(a)}{h}$

$= \dfrac{[3(a^2 + 2ah + h^2) - (a + h) + 2] - [3a^2 - a + 2]}{h} = (6a - 1) + 3h$

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

1. $f(x) = \dfrac{1}{x^4 - 16}$

$x \neq \pm 2$

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

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

$x \geq 0$ and $11 - x \geq 0$, so

$[0, 11]$

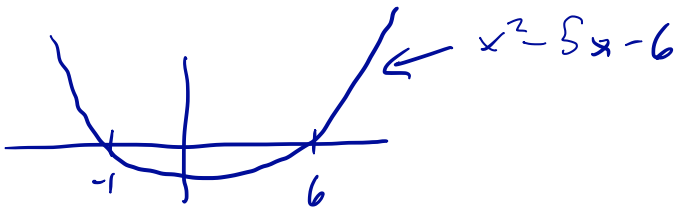
3. $g(x) = \ln(x - 4)$

$x - 4 > 0$ so

$(4, \infty)$

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

$x^2 - 5x - 6 > 0$



$(-\infty, -1) \cup (6, \infty)$

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