

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  $f$

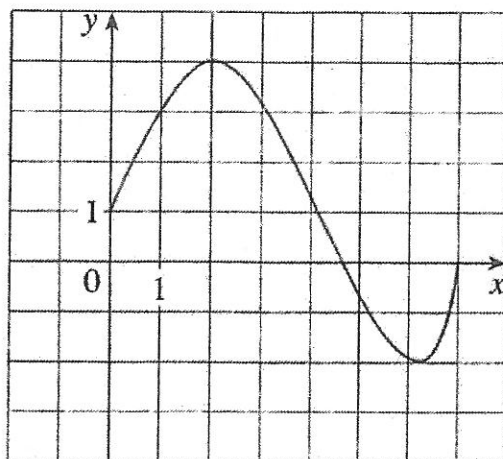
$$[-2, 4]$$

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

