AP Calculus AB
Worksheet – Functions, Domain, Range, Piecewise

Name Key

Given the function $f(x) = 3x^2 + 2x$, evaluate each function at the requested value.

$f(-2) =$

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

$f(-2) = 3(4) - 4$

$f(-2) = 8$

$f(-\sqrt{3}) =$

$f(-\sqrt{3}) = 3(-\sqrt{3})^2 + 2(-\sqrt{3})$

$f(-\sqrt{3}) = 3(3) - 2\sqrt{3}$

$f(-\sqrt{3}) = 9 - 2\sqrt{3}$

$f\left(\frac{1}{t}\right) =$

$f\left(\frac{1}{t}\right) = 3\left(\frac{1}{t}\right)^2 + 2\left(\frac{1}{t}\right)$

$f\left(\frac{1}{t}\right) = \frac{3}{t^2} + \frac{2}{t}$

OR

$f\left(\frac{1}{t}\right) = \frac{3+2t}{t^2}$

$f(3t^2) =$

$f(3t^2) = 3(3t^2)^2 + 2(3t^2)$

$f(3t^2) = 3(9t^4) + 6t^2$

$f(3t^2) = 27t^4 + 6t^2$

$f(a+1) =$

$f(a+1) = 3(a+1)^2 + 2(a+1)$

$f(a+1) = 3(a^2+2a+1) + 2a + 2$

$f(a+1) = 3a^2 + 6a + 3 + 2a + 2$

$f(a+1) = 3a^2 + 8a + 5$

$\frac{f(c+h) - f(c)}{h} =$

$\frac{3(c+h)^2 + 2(c+h) - [3c^2 + 2c)]}{h}$

$\frac{3(c^2 + 2ch + h^2) + 2c + 2h - 3c^2 - 2c}{h}$

$\frac{3c^2 + 6ch + 3h^2 + 2h - 3c^2}{h}$

$\frac{6ch + 3h^2 + 2h}{h}$

$6c + 3h + 2$

State the natural domain of the given functions.

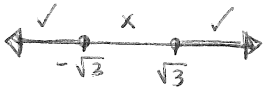
$f(x) = \sqrt{x^2 - 3}$

$x^2 - 3 = 0$

$x^2 = 3$

$x = \pm\sqrt{3}$

D: $(-\infty, -\sqrt{3}] \cup [\sqrt{3}, \infty)$



$h(x) = \sqrt{\frac{x-1}{x+2}}$

D: $(-\infty, -2) \cup [1, \infty)$

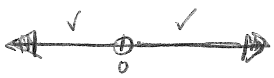
$\frac{x-1}{x+2} = 0$ $\quad x+2 = 0$

$x = 1$ $\quad x = -2$

$f(x) = \frac{x}{|x|}$

$x = 0$

D: $(-\infty, 0) \cup (0, \infty)$



$g(x) = \sin\sqrt{x}$

$x = 0$

D: $[0, \infty)$

State the natural domain and range of given functions.

$g(x) = \sqrt{4 - x^2}$

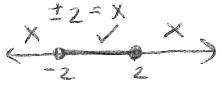
$4 - x^2 = 0$

$4 = x^2$

$\pm 2 = x$

D: $[-2, 2]$

R: $[0, 2]$

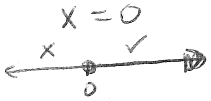


$f(x) = 3 + \sqrt{x}$

$x = 0$

D: $[0, \infty)$

R: $[3, \infty)$



$h(x) = x^2 + 3$

D: $(-\infty, \infty)$

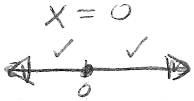
R: $[3, \infty)$

$f(x) = 3\sin x$

$x = 0$

D: $(-\infty, \infty)$

R: $[-3, 3]$



Find the value of x given the value of the function.

$k(x) = \sqrt{3x-2}$, $k(x) = a$, $a = 6$

$a = \sqrt{3x-2}$

$6^2 = (\sqrt{3x-2})^2$

$36 = 3x - 2$

$38 = 3x$ $\quad x = \frac{38}{3}$

$f(x) = \sin^2 x - x^2 + 4$, $f(x) = b$, $b = -3$ (use a calculator for this problem)

$b = \sin^2 x - x^2 + 4$

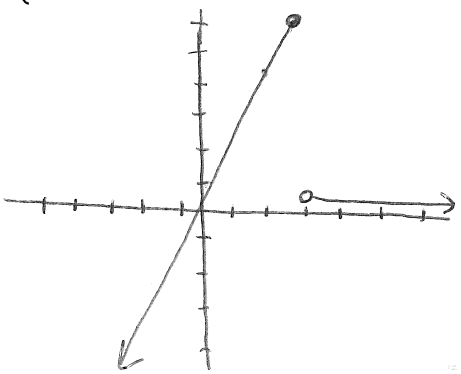
$-3 = \sin^2 x - x^2 + 4$

$0 = \sin^2 x - x^2 + 7$

$x = -2.683, 2.683$

$$h(x) = \begin{cases} \frac{1}{x} & \text{if } x > 3 \quad (3, \frac{1}{3}) \\ 2x & \text{if } x \le 3 \quad (3, 6) \end{cases}$$

$h(-4) = -8$ $\quad h(4) = \frac{1}{4}$ $\quad h(3) = 6$ $\quad h(t^2+5) = \frac{1}{t^2+5}$



$$g(x) = \begin{cases} 1 & \text{if } t \le 0 \quad (0,1) \\ t+1 & \text{if } 0 < t < 2 \quad (0,1) \ (2,3) \\ t^2 - 1 & \text{if } t \ge 2 \quad (2,3) \end{cases}$$

$g(0) = 1$ $\quad g(6) = 35$ $\quad g(-2) = 1$