2.2.25

Exercise 2.2.25 Consider $f(x) = 3x^2 + x - 2$.

(a) Is the point $(1, 2)$ on the graph of f?

(b) If $x = -2$, what is $f(x)$? What point is on the graph of f?

(c) If $f(x) = -2$, what is x? What point(s) are on the graph of f?

(d) What is the domain of f?

(e) List the x-intercepts, if any, of the graph of f.

(f) List the y-intercept, if there is one, of the graph of f.

Solution

(a) When $x = 1$, $f(x) = f(1) = 3(1)^2 + (1) - 2 = 2$, so YES $(1, f(1)) = (1, 2)$ is on the graph.

(b) If $x = -2$, then $f(-2) = 3(-2)^2 + (-2) - 2$
$= 3(4) - 2 - 2 = 12 - 4 = 8$, so the point $(-2, f(-2)) = (-2, 8)$ is on the graph.

(c) If $f(x) = -2$ then $3x^2 + x - 2 = -2$ or $3x^2 + x = 0$ or $x(3x + 1) = 0$ or either $x = 0$ or $x = -1/3$. So the points $(0, f(0)) = (0, -2)$ and $\left(-\frac{1}{3}, f\left(-\frac{1}{3}\right)\right) = \left(-\frac{1}{3}, -2\right)$ are on the graph.

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(d) Since $f(x) = 3x^2 + x - 2$ is a quadratic function, then its domain is all real numbers $\mathbb{R} = (-\infty, \infty)$.

(e) For the x-intercepts, we set $f(x) = 0$ and consider $3x^2 + x - 2 = 0$ or $(3x - 2)(x + 1) = 0$, so either $x = 2/3$ or $x = -1$. The x-intercepts are $(-1, 0)$ and $(2/3, 0)$.

(f) For the y-intercept, we set $x = 0$ and get $f(0) = 3(0)^2 + (0) - 2 = -2$. So the y-intercept is $(0, -2)$. □