Problem 1. Section 1.1 #8

For the following exercises, find the values for $f(x) = 4x^2 - 3x + 1$; if they exist, then simplify.

a. $f(0) = 4(0)^2 - 3(0) + 1 = \boxed{1}$

b. $f(1) = 4(1)^2 - 3(1) + 1 = 4 - 3 + 1 = \boxed{2}$

c. $f(3) = 4(3)^2 - 3(3) + 1 = 36 - 9 + 1 = \boxed{28}$

d. $f(-x) = 4(-x)^2 - 3(-x) + 1 = \boxed{4\mathrm{x}^2 + 3x + 1}$

e. $f(a) = 4(a)^2 - 3(a) + 1 = \boxed{4\mathrm{a}^2 - 3a + 1}$

f. $f(a+h) = 4(a+h)^2 - 3(a+h) + 1 = 4(a^2 + 2ah + h^2) - 3(a+h) + 1 = \boxed{4\mathrm{a}^2 + 8ah + 4h^2 - 3a - 3h + 1}$

Problem 2. Section 1.1 #10

For the following exercises, find the values for $f(x) = |x - 7| + 8$; if they exist, then simplify.

a. $f(0) = |0 - 7| + 8 = |-7| + 8 = 7 + 8 = \boxed{15}$

b. $f(1) = |1 - 7| + 8 = |-6| + 8 = 6 + 8 = \boxed{14}$

c. $f(3) = |3 - 7| + 8 = |-4| + 8 = 4 + 8 = \boxed{12}$

d. $f(-x) == \boxed{|-x - 7| + 8}$

e. $f(a) = \boxed{|a - 7| + 8}$

f. $f(a + h) = \boxed{|a + h - 7| + 8}$

Problem 3. Section 1.1 #36

For $f(x) = 3x + 4$ and $g(x) = x - 2$, find $f + g$, $f - g$, $f \cdot g$, and f/g. Determine the domain of each of these new functions.

a. $(f + g)(x) = f(x) + g(x) = (3x + 4) + (x - 2) = \boxed{4\mathrm{x}+2}$.

The domain is $\boxed{\mathbb{R}}$.

b. $(f - g)(x) = f(x) - g(x) = (3x + 4) - (x - 2) = \boxed{2\mathrm{x}+6}$.

The domain is $\boxed{\mathbb{R}}$.

c. $(f \cdot g)(x) = f(x) \cdot g(x) = (3x + 4)(x - 2) = \boxed{3\mathrm{x}^2 - 2x - 8}$.

The domain is $\boxed{\mathbb{R}}$.

d. $(f/g)(x) = \frac{f(x)}{g(x)} = \boxed{\dfrac{3x + 4}{x - 2}}$.

The domain is $\boxed{\{x \mid x \neq 2\}}$.

Problem 4. Section 1.1 #40

For $f(x) = \sqrt{x}$ and $g(x) = x - 2$, find $f + g$, $f - g$, $f \cdot g$, and f/g. Determine the domain of each of these new functions.

a. $(f + g)(x) = (\sqrt{x}) + (x - 2) = \boxed{\sqrt{x} + x - 2}$.

The domain is $\boxed{[0, \infty)}$.

b. $(f - g)(x) = (\sqrt{x}) - (x - 2) = \boxed{\sqrt{x} - x + 2}$.

The domain is $\boxed{[0, \infty)}$.

c. $(f \cdot g)(x) = (\sqrt{x}) \cdot (x - 2) = \boxed{\mathrm{x}^{\frac{3}{2}} - 2\sqrt{x}}$.

The domain is $\boxed{[0, \infty)}$.

d. $(f/g)(x) = \boxed{\dfrac{\sqrt{x}}{x - 2}}$.

The domain is $\boxed{\{\mathrm{x} \mid x \geq 0, x \neq 2\}}$.

Problem 5. Section 1.1 #42

For $f(x) = 3x$ and $g(x) = x + 5$, find $(f \circ g)(x)$ and $(g \circ f)(x)$. Simplify. Find the domain of each of the results.

a. $(f \circ g)(x) = f(g(x)) = f(x + 5) = 3(x + 5) = \boxed{3x + 15}$.

The domain is $\boxed{\mathbb{R}}$.

b. $(g \circ f)(x) = g(f(x)) = g(3x) = \boxed{3x + 5}$.

The domain is $\boxed{\mathbb{R}}$.

Problem 6. Section 1.1 #46

For $f(x) = \sqrt{x}$ and $g(x) = x + 9$, find $(f \circ g)(x)$ and $(g \circ f)(x)$. Simplify. Find the domain of each of the results.

a. $(f \circ g)(x) = f(g(x)) = f(x + 9) = \boxed{\sqrt{x + 9}}$.

The domain is $\boxed{[\text{-}9,\ \infty)}$.

b. $(g \circ f)(x) = g(f(x)) = g(\sqrt{x}) = \boxed{\sqrt{x} + 9}$.

The domain is $\boxed{[0, \infty)}$.

Problem 7. Section 1.1 #56

An American tourist visits Paris and must convert U.S. dollars to Euros, which can be done using the function $E(x) = 0.79x$*, where* x *is the number of U.S. dollars and* $E(x)$ *is the equivalent number of Euros. Since conversion rates fluctuate, when the tourist returns to the United States 2 weeks later, the conversion from Euros to U.S. dollars is* $D(x) = 1.245x$*, where* x *is the number of Euros and* $D(x)$ *is the equivalent number of U.S. dollars.*

a. *Find the composite function that converts directly from U.S. dollars to U.S. dollars via Euros. Did this tourist lose value in the conversion process?*

Since we want to first convert U.S. dollars to Euros, we start with the function $E(x)$. Then, since we want to convert those Euros back to U.S. dollars, we apply the function D to $E(x)$, to get $D(E(x))$, also written $(D \circ E)(x)$. We calculate this function to be:

$$D(E(x)) = D(0.79x) = 1.245(0.79x) = 0.98355x$$

Since this function makes positive numbers smaller, we conclude that the tourist $\boxed{\text{lost value}}$ in the conversion process.

b. *Use (a) to determine how many U.S. dollars the tourist would get back at the end of her trip if she converted an extra \$200 when she arrived in Paris.*

We want to calculate $(D \circ E)(200)$, which is $0.98355 \cdot 200 = 196.71$, so she would get back $\boxed{\$196.71}$.