2.1.8. Define functions $f$ and $g$ such that
\[ f(x) = \frac{x}{x - 3} \quad \text{and} \quad g(x) = \frac{12}{x^2 - 2x - 3} \]
(a) Find and simplify $(f - g)(x)$.
Answer: $(f - g)(x) = \frac{2x + 4}{x^2 + 1}$
(b) Find and simplify $(g/f)(x)$.
Answer: $(g/f)(x) = \frac{12}{x^2 + x}$

2.1.9. Define functions $f$ and $g$ such that
\[ f(x) = \frac{x}{x - 3} \quad \text{and} \quad g(x) = \frac{12}{x^2 - 2x - 3} \]
(a) Find and simplify $(f + g)(x)$.
Answer: $(f + g)(x) = \frac{2x^2 + 4x - 10}{x^2 + x}$
(b) Find and simplify $(f - g)(x)$.
Answer: $(f - g)(x) = \frac{2x + 4}{x^2 + 1}$
(c) Find and simplify $(f/g)(x)$.
Answer: $(f/g)(x) = \frac{x^2 + 2x - 2}{x^2 + 5x + 4}$
(d) Find and simplify $(f + g)(x)$.
Answer: $(f + g)(x) = \frac{2x^2 + 3x - 14}{x^2 + 5x + 4}$

2.1.10. Consider the following functions:
\[ f(x) = 1 - x^2 \]
\[ h(x) = \frac{x^2 - x - 12}{x^2 + 7x + 10} \]
\[ p(x) = x + 5 \]
\[ q(x) = x - 4 \]
\[ r(x) = \frac{1}{x + 3} \]
Find and simplify the following:
(a) $(f + pq)(x)$
Answer: $(f + pq)(x) = x - 19$
(b) $\left( \frac{hr}{q} \right)(x)$
Answer: $\left( \frac{hr}{q} \right)(x) = \frac{1}{x^2 + 7x + 10}$
(c) $(ph)(x)$
Answer: $(ph)(x) = \frac{x^2 - x - 12}{x^2 + 2}$
(d) $\frac{p(x)}{h(x)}$
Answer: $\frac{p(x)}{h(x)} = \frac{x^2 + 7x + 10}{x - 4}$

2.1.11. The functions $f$ and $g$ are graphed below. Sketch the graph of $f + g$. (Assume that $f$ has a vertical asymptote at $x = 0$.)

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Answer: On graph below
2.1.12. The functions $f$ and $g$ are graphed below. Sketch the graph of $f + g$. 

2.1.13. The functions $f$ and $g$ are graphed below. Sketch the graph of $f + g$. 

2.1.14. The functions $f$ and $g$ are graphed below. Sketch the graph of $f + g$.
2.1.15. A friend of mine knits and sells blankets. After doing some market research she found a demand function, $D$. That is, if she charges $x$ dollars for each blanket then she will be able to sell $D(x)$ blankets in a month where $D(x) = 25 - x/2$. In such a month her costs are given by $C(x) = 150 - 2x$ when she charges $x$ dollars for each blanket.

(a) The revenue function $R$ is defined such that $R(x) = xD(x)$. Find and simplify the revenue function.

**Answer:** $R(p) = -\frac{1}{2}p^2 + 25p$

(b) Find and simplify the profit function, $P$. Hint: How do we find profit from cost and revenue?

**Answer:** $M(p) = -\frac{1}{2}p^2 + 27p - 150$

(c) How much should she charge for each blanket to maximize her profit? Hint: How do we find the highest point on a quadratic polynomial?

**Answer:** $27$

(d) What is the maximum profit that she can make in a month? Hint: What is the profit that she earns if she charges the price determined in part (c)?

**Answer:** $214.50$