Exercise 1. (Sketch the graph) The details can vary for every student. It must be something reasonable though!

Exercise 2. (Domain and range)

(a) The domain is \( \mathbb{R} \), the range is \([0, +\infty)\).
(b) The domain is \( \mathbb{R} \), the range is \([1, +\infty)\).
(c) The domain is \( \mathbb{R} \), the range is \([0, +\infty)\).
(d) The domain is \( \mathbb{R} \setminus \{-3, 2\} \), the range is \((-\infty, \frac{2}{25}(17 - \sqrt{39})] \cup \left[ \frac{2}{25}(17 + \sqrt{39}) , +\infty \right)\).
(e) The domain is \( \mathbb{R} \setminus \{-2, 2\} \), the range is \((-\infty, \frac{1}{3}(-2 - \sqrt{3})] \cup \left[ \frac{1}{3}(-2 + \sqrt{3}) , +\infty \right)\).
(f) The domain is \( \mathbb{R} \), the range is \( \left[ \frac{1}{4}(4 - 3\sqrt{2}) , \frac{1}{4}(4 + 3\sqrt{2}) \right] \).
(g) The domain is \( \mathbb{R} \), the range is \([-1, +\infty)\).

Exercise 3. (Combinations of 2 functions)

(a) \( f(x) + g(x) = 2x^2 + x + 8 \), of degree 2, \( f(x) - g(x) = 2x^2 - x - 6 \), of degree 2, \( f(x)g(x) = 2x^3 + 14x^2 + x + 7 \), of degree 7, \( \frac{f(x)}{g(x)} = \frac{2x^2 + 1}{x+7} \), with domain \( \mathbb{R} \setminus \{-7\} \), \( f(g(x)) = 2x^2 + 28x + 99 \), of degree 2.
(b) For example \( f(x) = x^3 + 7x \), \( g(x) = -x^3 + 1 \).

Exercise 4. (Domains)

(a) The domain of \( f \) is \( \mathbb{R} \setminus \{-3, 1\} \), the domain of \( g \) is \( \mathbb{R} \setminus \{-2, 1\} \), the domain of \( h \) is \( \mathbb{R} \setminus \{-3, -2\} \).
(b) The domain of \( f - g \) is \( \mathbb{R} \setminus \{-3, -2, 1\} \).
(c) \( f - g \) and \( h \) are not the same function, because they have different domains. As functions on the smaller domain \((-2, 1)\) they are the same.
Exercise 5. (Even and odd functions)

(a) A polynomial is an even function if and only if all the exponents of its terms are even numbers. A polynomial is an odd function if and only if all the exponents of its terms are odd numbers.

(b) Just separate the terms with even exponents from the terms with odd exponents.

(c) Write $g_1(x) = f(x) + f(-x)$, $g_2(x) = f(x) - f(-x)$. Then $g_1$ is even, $g_2$ is odd and

$$f = \frac{1}{2} g_1 + \frac{1}{2} g_2.$$