Q1. $f(x) = 2x - 5$ $\{-3, \leq x \leq 3\}$

$f(-3) = -11$ $f(-2) = -9$ $f(-1) = -7$ $f(0) = -5$ $f(1) = -3$ $f(2) = -1$ $f(3) = 1$

$\{-11, -9, -7, -5, -3, -1, 1\}$ ✓

Q2. $f(x) = \dfrac{x-2}{5}$ $f(k) = 2$ $\dfrac{k-2}{5} = 2$ $k - 2 = 10$ $k = 12$ ✓

Q3. $f(x) = x^2 + 2$ $g(x) = 2x + 3$

$f(g(x)) = (2x+3)^2 + 2$ ✓ $g(f(x)) = 2(x^2+2) + 3$ ✓
$\qquad\qquad = 4x^2 + 12x + 9 + 2$ $= 2x^2 + 4 + 3$
$\qquad\qquad = 4x^2 + 12x + 11$ ✓ $= 2x^2 + 7$ ✓

Q4. $f(x) = 6x^2 - 4x$ $g(x) = \dfrac{1}{3x - 6}$

(a) $g(f(x)) = \dfrac{1}{3(6x^2 - 4x) - 6} = \dfrac{1}{18x^2 - 12x - 6} = \dfrac{1}{6(3x^2 - 2x - 1)} = \dfrac{1}{6(3x+1)(x-1)}$ ✓

(b) $g(f(x))$ domain $\{x \in \mathbb{R}, x \neq -\frac{1}{3}, 1\}$ ✓

Q5. $f(x) = (x-1)(x+3)$ $g(x) = x^2 + 3$

$f(g(x)) = (x^2+3-1)(x^2+3+3)$ ✓ $g(g(x)) = (x^2+3)^2 + 3$ ✓
$\qquad\quad = (x^2+2)(x^2+6)$ $= x^4 + 6x^2 + 9 + 3$
$\qquad\quad = x^4 + 8x^2 + 12$ ✓ $= x^4 + 6x^2 + 12$ ✓

$\qquad\qquad x^4 + 8x^2 + 12 - (x^4 + 6x^2 + 12)$
$\qquad\qquad = x^4 + 8x^2 + 12 - x^4 - 6x^2 - 12$ ✓
$\qquad\qquad\qquad = 2x^2$ ✓

Q6. $f(x) = \dfrac{4}{x+2}$ $g(x) = \dfrac{2}{x} - 2$

$f(g(x)) = \dfrac{4}{\left(\frac{2}{x} - 2\right) + 2} = \dfrac{4}{2/x} = 4 \div \dfrac{2}{x} = 4 \times \dfrac{x}{2} = \dfrac{4x}{2} = 2x$ ✓

Q7. $f(x) = 3x - 10$ $g(x) = 4 - 2x$ $h(x) = \frac{1}{6}(2-x)$

(a) $k(x) = f(g(x)) = 3(4-2x) - 10 = 12 - 6x - 10 = 2 - 6x$ ✓

(b) $h(k(x)) = \frac{1}{6}(2 - (2-6x)) = \frac{1}{6}(6x) = x$ ✓

(c) h is the inverse of k ✓

Q8. (i) $f^{-1}(x) = \sqrt[3]{x-2}$

$y = f(x)$

$y = x$

$y = f^{-1}(x)$