1. - $f(0) = -4$
   - $f(2) = 10$
   - $f\left(\sqrt{2}\right) = 3\sqrt{2}$
   - $f\left(1+\sqrt{2}\right) = 7\sqrt{2}+5$
   - $f(-x) = 2x^2 - 3x - 4$
   - $f(x+h) = 2x^2 + 4xh + 3x + 2h^2 + 3h - 4$
   - $2f(x) = 4x^2 + 6x - 8$
   - $f(2x) = 8x^2 + 6x - 4$

2. $\dfrac{f(x+h)-f(x)}{h} = -2x - h + 1,\ h \neq 0$

3. Domain
   $x \in [-2, 3]$

   Range
   Since $f(-2) = 14$ and $f(3) = -6$ and f is linear, the range is $[-6, 14]$.

4. Domain
   $f \exists$ when $2x - 5 > 0 \longrightarrow$ the domain is $\left[\dfrac{5}{2}, \infty\right)$

   Range
   $[0, \infty)$

5. $g \nexists$ when $x^2 - 1 = 0 \longrightarrow x = 1$ or $x = -1 \therefore$ the domain of f is $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$.

6. $f \exists$ when $x^2 - 6x \geq 0$.
   Since $x^2 - 6x \geq 0$ when $x \in (-\infty, 0] \cup [6, \infty)$, the domain of f is $(-\infty, 0] \cup [6, \infty)$.

7. $f \exists$ when $\dfrac{x}{\pi - x} \geq 0$.
   Since $\dfrac{x}{\pi - x} \geq 0$ when $x \in [0, \pi)$, the domain of f is $[0, \pi)$.

8. Domain

   $f \exists$ when $-x \geq 0$.
   $-x \geq 0 \longrightarrow x \leq 0 \longrightarrow$ the domain of f is $(-\infty, 0]$.

   Range

   $[0, \infty)$

9. Domain

   $g \nexists$ when $x = 1$.
   $\therefore$ the domain of f is $(-\infty, 1) \cup (1, \infty)$.

   Range

   $g(x) = \dfrac{(x+1)(x-1)}{x-1}$ and $x \neq 1$ so $g(x) \neq 2$.
   $\therefore$ the range of g is $(-\infty, 2) \cup (2, \infty)$.

10. Domain is given as $(-\infty, \infty)$

11. Domain

    Given as $(-\infty, \infty)$

    Range

    $(-\infty, 5]$ obtained from a sketch of g.

12. Yes, it is a function ... it passes the vertical line test.

    Domain: $[-2, 3]$

    Range: $[-2, 2]$

13. $f(x) = \begin{cases} \dfrac{4}{3}(x+1) & x \in [-1, 2] \\ -\dfrac{4}{3}(x-5) & x \in (2, 5] \end{cases}$

14. Draw a sketch.
    Height of box: x
    Length of box: $12 - 2x$
    Width of box: $20 - 2x$

    $V(x) = x(12 - 2x)(20 - 2x)$

15. $f(x) = \dfrac{1}{x^2}$

    $f(-x) = \dfrac{1}{(-x)^2} = \dfrac{1}{x^2}$

    Since $f(x) = f(-x)\,\forall\, x, f$ is even.

16. $g(x) = x^2 + x$
    $g(-x) = x^2 - x$
    $-g(x) = -x^2 - 1$

    Since $g(x) \neq g(-x), g$ is not even.
    Since $g(-x) \neq -g(x), g$is not odd.
    Therefore, g is neither odd nor even.

17. $f(x) = x^3 - x$
    $f(-x) = -x^3 + x$
    $-f(x) = -x^3 + x$

    Since $f(-x) = -f(x), f$ is odd.

18. $f \circ g$

    $f(g(x)) = f(x^3 + 2x) = \dfrac{1}{x^3 + 2x}$

    Domain

    $\dfrac{1}{x^3 + 2x} \nexists$ when $x = 0$ and the domain of g is $(-\infty, \infty)$ $\therefore$ the domain of $f \circ g$ is $(-\infty, 0) \cup (0, \infty)$

$\underline{g \circ f}$

$g(f(x)) = g\left(\dfrac{1}{x}\right) = \dfrac{2x^2+1}{x^3}$

<u>Domain</u>

$\dfrac{2x^2+1}{x^3} \nexists$ when $x = 0$ and the domain of f is $x \neq 0$ $\therefore$ the domain of $g \circ f$ is $(-\infty, 0) \cup (0, \infty)$

19. $\underline{f \circ g}$

$f(g(x)) = f\left(1+\sqrt{x}\right) = \sqrt[3]{1-\sqrt{x}}$

<u>Domain</u>

$\sqrt[3]{1-\sqrt{x}} \exists$ when $x \geq 0$ and the domain of g is $[0, \infty)$ $\therefore$ the domain of $f \circ g$ is $[0, \infty)$

$\underline{g \circ f}$

$g(f(x)) = g\left(\sqrt[3]{x}\right) = 1 - \sqrt{\sqrt[3]{x}}$

<u>Domain</u>

$1 - \sqrt{\sqrt[3]{x}} \exists$ when $x \geq 0$ and the domain of f is $(-\infty, \infty)$ $\therefore$ the domain of $g \circ f$ is $[0, \infty)$