1) $x = y^2 - 5$ not a fun

2) yes a fun

3) $y = \sqrt{x^2 + 3}$ yes a fun

5) D. $(-\infty, \infty)$ 6) D. $(-\infty, 5]$
   R $[-3, \infty)$ R $[0, \infty)$

7) $f(x) = 4x^2 - 8x - 12$ $f(0) = 4(0)^2 - 8(0) - 12$ 8) $f(x) = x^3 + 4x^2 + 3x$
      $4(x^2 - 2x - 3)$ $f(0) = -12$ $x(x^2 + 4x + 3)$
      $4(x - 3)(x + 1)$ $x(x + 3)(x + 1)$
   $0 = 4(x - 3)(x + 1)$ $(0, -12)$ $0 = x(x + 3)(x + 1)$
   $x = 3$; $x = -1$ $(3, 0) (-1, 0)$ $x = 0, -3, -1$
                                                             $(0,0) (-3,0)(-1,0)$

9) D

11) $f(x) = \dfrac{x - 3}{x^2 - 9}$

2.9	2.99	2.999	3	3.001	3.01	3.1
-1.525	-16.520	-166.5		1668	1680	1.803

$f(3) = \frac{3-3}{3^2-9}$
$f(3) = \frac{0}{0}$

undefined   infinite   discontinuity

10) $f(x) = 2x$ $x < 3$
       $9 - x$ $x \geq 3$
   $f(3) = 9 - 3$
   $f(3) = 6$

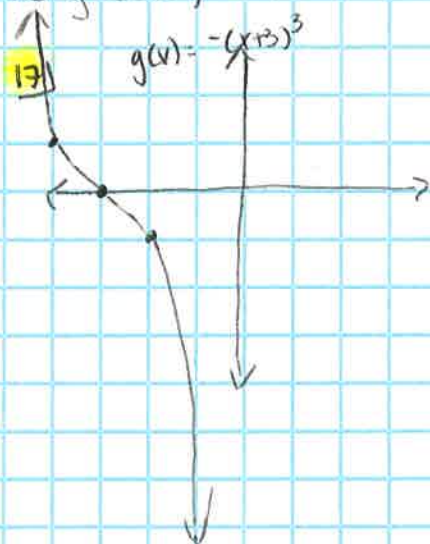| 2.9	2.99	2.999	3	3.01	3.01	3.1
5.9	5.98	5.998	6	5.999	5.99	5.9

continuous

12) $f(x) = -x^4 + 3x$ $[-2, 6]$
    $\dfrac{f(6) - f(-2)}{.6 - (-2)}$ $\dfrac{-1278 - (-22)}{6 - (-2)}$ $= -157$

13) $f(x) = \sqrt{x + 3}$
    $\dfrac{f(6) - f(-2)}{6 - (-2)}$ $\dfrac{3 - 1}{6 + 2} = \dfrac{2}{8} = \dfrac{1}{4}$
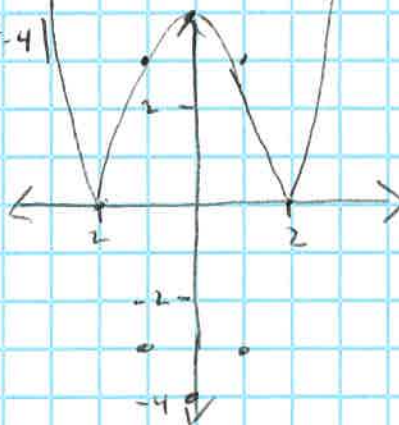
14) increasing $(-\infty, 3.5)$ 15) decreasing $(-\infty, -1.5)$ ⤴ $(0, 1.5)$
    decreasing $(3.5, \infty)$ increasing $(-1.5, 0)$ ⤴ $(1.5, \infty)$

16) H   17) $g(x) = -(x+3)^3$ 18) $g(x) = |x^2 - 4|$

22) $f(x) = (x-2)^3$ yes

$$x = (y-2)^3$$
$$\sqrt[3]{x} = y-2$$
$$2+\sqrt[3]{x} = y$$

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

23) $f(x) = \dfrac{x+3}{x-8}$ yes

$$x = \frac{y+3}{y-8}$$
$$x(y-8) = y+3$$
$$xy - 8x = y+3$$
$$xy - y = 3 + 8x$$
$$y(x-1) = 3+8x$$
$$y = \frac{3+8x}{x-1}$$
$$f^{-1}(x) = \frac{3+8x}{x-1}$$

24) $f(x) = \sqrt{4-x}$

$$x = \sqrt{4-y}$$
$$x^2 = 4-y$$
$$x^2 - 4 = -y$$
$$4 - x^2 = y$$

$$4 - x^2 = f^{-1}(x)$$
$$x \geq 0$$

25) $f(x) = x^2 - 16$

no

19)
$$\left(\frac{f}{g}\right)(x) = \frac{x-6}{x^2-36}$$
$$= \frac{x-6}{(x-6)(x+6)}$$
$$= \frac{1}{x+6}$$

D: $x^2 - 36 \neq 0$
$$x^2 = 36$$
$$x \neq \pm 6$$
$$(-\infty, -6) \cup (-6, 6) \cup (6, \infty)$$

20) $[g \circ f](x) = (x-6)^2 - 36$ D: $(-\infty, \infty)$
$$= x^2 - 12x + 36 - 36$$
$$= x^2 - 12x$$