Sec 1.1 p. 21 (2, 5-8, 23, 25, 27, 29, 32, 38, 45, 47, 52, 55)

2 a) $f(-4) = -2$ b) $x = -2$ and $x = 2$ c) $f(x) = -1$ when $x = -4$ or 4

$g(3) = 4$

d) $[0, 4]$ e) domain $[-4, 4]$ range $[-2, 3]$

f) domain $[-4, 3]$ range $[\frac{1}{2}, 4]$

5 not a function does not pass vertical line test

6 is a function domain: $[-2, 2]$ range: $[-1, 2]$

7 is a function domain: $[-3, 2]$ range: $[-3, -2) \cup [-1, 3]$

8 not a function, does not pass the vertical line test

23 $f(2) = 3(2)^2 - 2 + 2 = \boxed{12}$

$f(-2) = 3(-2)^2 + 2 + 2 = \boxed{16}$

$f(a) = 3a^2 - a + 2$

$f(-a) = 3a^2 + a + 2$

$f(a+1) = 3(a+1)^2 + a + 1 + 2 = 3a^2 + 6a + 3 + a + 3 = \boxed{3a^2 + 7a + 6}$

$2f(a) = 6a^2 - 2a + 4$

$f(2a) = 3(2a)^2 - 2a + 2 = 3(4a^2) - 2a + 2 = \boxed{12a^2 - 2a + 2}$

$f(a^2) = 3(a^2)^2 - a^2 + 2 = \boxed{3a^4 - a^2 + 2}$

$(f(a))^2 = (3x^2 - x + 2)(3x^2 - x + 2)$
$= 9x^4 - 3x^3 + 6x^2 - 3x^3 + x^2 - 2x + 6x^2 - 2x + 4$
$= \boxed{9x^4 - 6x^3 + 13x^2 - 4x + 4}$

$f(a+h) = 3(a+h)^2 - (a+h) + 2$
$= \boxed{3a^2 + 6ah + h^2 - a - h + 2}$

(25) $f(x) = 4 + 3x - x^2 \qquad \dfrac{f(3+h) - f(3)}{h}$

$f(3+h) = 4 + 3(3+h) - (3+h)^2$
$= 4 + 9 + 3h - 9 - 6h - h^2$
$= 4 - 3h - h^2$

$f(3) = 4 + 3(3) - 3^2 = 4 + 9 - 9 = 4$

$\Rightarrow \dfrac{(4 - 3h - h^2) - 4}{h} = \dfrac{-3h - h^2}{h} = \boxed{-3 - h}$

(27) $f(x) = \dfrac{1}{x} \qquad \dfrac{f(x) - f(a)}{x - a}$

$\dfrac{\frac{1}{x} - \frac{1}{a}}{x - a} \Rightarrow$ LCD is ax so $\dfrac{\frac{a}{ax} - \frac{x}{ax}}{x - a}$

$\Rightarrow \dfrac{\frac{a-x}{ax}}{x-a}$ dividing by $x-a$ is the same as multiplying by $\dfrac{1}{x-a}$.

$\dfrac{a-x}{ax}\left(\dfrac{1}{x-a}\right) = \dfrac{-1(x-a)}{ax}\left(\dfrac{1}{x-a}\right) = \boxed{\dfrac{-1}{ax}}$

(29) $f(x) = \dfrac{x+4}{x^2-9}$ $\Rightarrow$ The only issue with this function is a possible 0 in the denominator.

so $x^2-9 \neq 0$

$x^2-9=0$ when $x = \pm 3$

$\therefore$ Domain $(-\infty,-3) \cup (-3,3) \cup (3,\infty)$

(32) $g(t) = \sqrt{3-t} - \sqrt{2+t}$ $\Rightarrow$ we have two possible issues here. Neither root can be less than 0.

so $3-t \geq 0$ and $2+t \geq 0$

Solving both we get

$t \leq 3$ and $t \geq 2$.

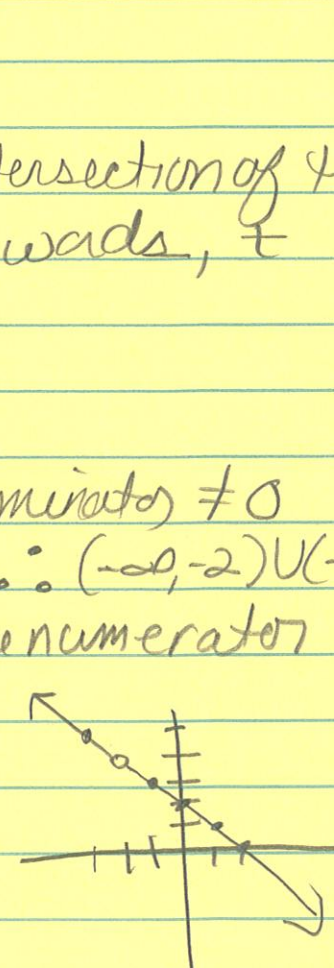
We interpret this as the intersection of these two inequalities. In other words, t must be between 2 and 3.

$\therefore$ Domain $[2, 3]$.

(38) $H(t) = \dfrac{4-t^2}{2+t}$ Domain : Denominator $\neq 0$

so $t \neq -2$ $\therefore (-\infty,-2) \cup (-2,\infty)$

To sketch a graph, factor the numerator and reduce.



$H(t) = \dfrac{(2-t)(2+t)}{2+t} = 2-t$

However, there must be a hole at $(-2, 4)$

(45) $f(x) = \begin{cases} x+2 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$

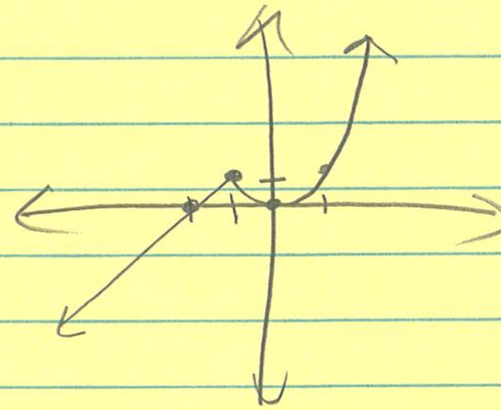
This means we use the graph of $x+2$ from $(-\infty, -1]$ and then x^2 from $(-1, \infty)$. Use $-1 = x$ for both to determine ending or starting point.

$x+2$

x	y
-1	1
-2	0

x^2

x	y
-1	1
0	0
1	1



(47) $(1,-3)\ (5,7)$ $\quad m = \dfrac{7 - -3}{5-1} = \dfrac{10}{4} = \dfrac{5}{2}$

$y - y = m(x - x) \Rightarrow y - 7 = \dfrac{5}{2}(x-5)$

$y = \dfrac{5}{2}x - \dfrac{25}{2} + 7 \Rightarrow y = \dfrac{5}{2}x - \dfrac{11}{2}$

$\boxed{f(x) = \dfrac{5}{2}x - \dfrac{11}{2} \text{ on } [1,5]}$

(52) we see in the graph 3 pieces. They change at $x=-2$ and $x=2$. The outher two are lines and the middle one is a semicircle.

① Left graph has slope $-3/2$ and $b=-3$
so $y = -3/2 x - 3$

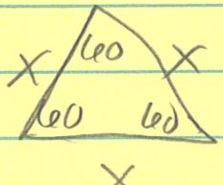
② Right graph has slope $3/2$ and $b=-3$
so $y = 3/2 x - 3$

③ Circle is centred at $(0,0)$ with a radius of 2 so $x^2+y^2=2^2$ or $y=\sqrt{4-x^2}$

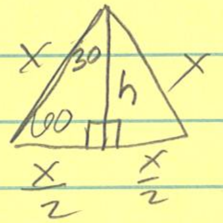
so

$$f(x) = \begin{cases} -\frac{3}{2}x - 3 & \text{if } x \le -2 \\ \sqrt{4-x^2} & \text{if } -2 < x \le 2 \\ \frac{3}{2}x - 3 & \text{if } x > 2 \end{cases}$$

(55)



$A = \frac{bh}{2}$ so we need to find the height in terms of x.



$h = \frac{x}{2}\sqrt{3}$ (30-60-90)

So $A = \frac{1}{2}\left(x\left(\frac{x\sqrt{3}}{2}\right)\right) = \frac{x^2\sqrt{3}}{4}$ but $x > 0$