Chapter 3
Sullivan 8th Edition
Practice for the Exam
Solutions

(73) $y = \sqrt{x}$

shift up 2
shift left 5
reflect on y $\Rightarrow -x$

"vertex" $(-5, 2)$

so $\boxed{y = \sqrt{-(x+5)} + 2}$

(1) function (no repeating x values)
Domain: $\{5, 6, 7, 8\}$
Range: $\{25, 30, 35, 40\}$ (B)

(2) not a function
Carl → dog, cat (C)

(3) function
domain: $\{-3, -2, 0, 2, 4\}$
range: $\{12, 7, 3, 19\}$ (B)

(4) function → no repeating x-values (A)

(5) $y = \frac{1}{x}$  passes vertical line test (VLT) ⇒ function (A)

(6) $y = |x|$  pass VLT function (A)

(7) $y = \pm\sqrt{1-7x}$ $\pm \Rightarrow$ 2 y's from 1 x
not a function (B)

(8) $y^2 + x = 7$ not a function (B)

(9) $y = 3x^2 - 6x + 7$ ↑↑ (parabola) pass VLT function (A)

(10) $f(2) = \sqrt{(2)^2 + 8(2)} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$ (C)

(11) $-f(x) = -(-3x^2+3x+3)$
$= \boxed{+3x^2-3x-3}$ (D)

(12) $f(x-1) = 4(x-1)^2+2(x-1)+3$ (C)
$= 4(x^2-2x+1)+2x-2+3$
$= 4x^2-8x+4+2x-2+3 = \boxed{4x^2-6x+5}$

(13) $f(x+h) = -2(x+h)^2-3(x+h)-4$
$= -2(x^2+2xh+h^2)-3x-3h-4$
$= -2x^2-4xh-2h^2-3x-3h-4$ (B)

(14) $f(x+h) = \dfrac{9(x+h)+2}{5(x+h)-2} = \boxed{\dfrac{9x+9h+2}{5x+5h-2}}$ (B)

(15) $f(x) = \dfrac{x-5A}{-10x+4}$ $\quad f(-10)=10$

$10 = \dfrac{-10-5A}{-10(-10)+4}$ (B)

$10 = \dfrac{-10-5A}{104} \Rightarrow \boxed{A=-210}$

(16) $g(x) = \dfrac{x}{x^2-1}$ $\quad x^2-1 \neq 0$
$(x+1)(x-1) \neq 0$ (D)
$x \neq 1, -1$

(17) $f(x) = x^2+8$ $\quad D = \mathbb{R}$ (D)

(18) $h(x) = \dfrac{x-2}{x^3-36x}$ $\quad x^3-36x \neq 0$
$x(x^2-36) \neq 0$ (C)
$x(x-6)(x+6) \neq 0$
$x \neq 0, -6, 6$

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

(4,0) opens up ← (4,0) $\quad D: x \leq 4$ (C)

(20) $\frac{x}{\sqrt{x-8}}$ $x-8>0$, $x>8$ (A)

(21) $f+g = (8-8x)+(-4x+8) = -12x+16$ $\mathbb{R}$ (B)

(22) $\frac{f}{g} = \frac{4x+1}{6x-5}$ $6x-5\neq 0$, $6x\neq 5$, $x\neq \frac{5}{6}$ (B)

(23) $f-g = (x-5)-(9x^2)$
$= -9x^2+x-5$ $\mathbb{R}$ (A)

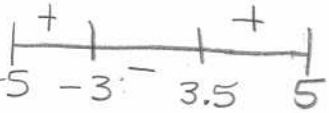
(24) $fg = (5x^3+1)(5x^2+3)$
$= 25x^5+15x^3+5x^2+3$ $\mathbb{R}$ (D)

(25) function
domain: $[-\pi, \pi]$
range: $[-1, 1]$ (B)

(26) function
domain: $[-2, \infty)$
range: $[0, \infty)$ (A)

(27) $f(8) \cong 2$ so positive (A)

(28) $f(x) > 0$



(A)

$[-5,-3) \cup (3.5,5)$

(29) How often does $y=-100$ cross $f(x)$? (D)

(30) When does $f(x) = -20$?

$(x, -20)$ $x = 10$ (B)

(31) $f(x) = -4x^2 + 8x - 6$ ↑↓ (A)

$D = \mathbb{R}$

(32) $f(x) = 4x^2 - 8x + 3$

$(2, 11)$? $f(2) = 4(2)^2 - 8(2) + 3$

$= 4(4) - 16 + 3 = 3$

no (B)

(33) $f(x) = \frac{x^2+2}{x+4}$ $x + 4 \neq 0$

$x \neq -4$ (A)

(34) $f(x) = \frac{x^2+5}{x-3}$ x int ($y = 0$)

$0 = \frac{x^2+5}{x-3}$

$0 = x^2 + 5$ $x^2 = -5$

$x = \pm\sqrt{-5}$

imaginary

so no x-int (D)

(35) $f(x) = \frac{x^2+8}{x-6}$ y int ($x = 0$) $f(0) = \frac{0+8}{0-6} = -\frac{4}{3}$

$(0, -4/3)$ (C)

(36) even (y axis symmetry) (A)

(37) neither (C)

(38) odd (origin symmetry) (B)

(39) even (yaxis symmetry) (A)

(40) $f(x) = -6x^2+8$

$f(-x) = -6(-x)^2+8$

$= -6x^2+8$

$f(-x) = f(x)$ so even (A)

(41) $f(x) = \sqrt[3]{9x^2+4}$

$f(-x) = \sqrt[3]{9(-x)^2+4} = \sqrt[3]{9x^2+4}$ (A)

$f(-x) = f(x)$ so even

(42) $f(x) = \dfrac{x}{x^2+4}$

$f(-x) = \dfrac{-x}{(-x)^2+4} = \dfrac{-x}{x^2+4} = -f(x)$ (B)

Since $f(-x) = -f(x)$ odd

(43) $f(x) = \dfrac{5x}{|x|}$ $f(-x) = \dfrac{5(-x)}{|-x|} = \dfrac{-5x}{|x|} = -f(x)$

since $f(-x) = -f(x)$ odd (B)

(44) interval $(-2,-1)$  decreasing (C)

(45) interval $(0,1)$  constant (B)

(46) interval $(-1,0)$  decreasing (B)

(47) the numbers (x) local minima -2 & 2 points $(-2,0)$ $(2,0)$

the local minima (y) are 0 & 0

(48) #'s for local maxima (x's) -8 2.2
local maxima (y's) 5 3.9

points $(-8, 5)$ $(2.2, 3.9)$

(49) $f(x) = x^3 - 4x^2 + 6$ $(-1, 4)$

see answer sheet

(50) $f(x) = x^3 - 3x + 3$ $(-2, 2)$ (B)

(51) $f(x) = x^2 + 1x$ from 1 to 4 [B]

rate of change (slope) $= \frac{f(4) - f(1)}{4 - 1} = \frac{20 - 2}{4 - 1} = \frac{18}{3} = 6$

(52) $f(x) = \sqrt{2x}$ from 2 to 8

rate of change (slope) $= \frac{f(8) - f(2)}{8 - 2} = \frac{4 - 2}{8 - 2} = \frac{2}{6} = \frac{1}{3}$

$f(8) = \sqrt{2 \cdot 8} = \sqrt{16} = 4$
$f(2) = \sqrt{2 \cdot 2} = \sqrt{4} = 2$

[C]

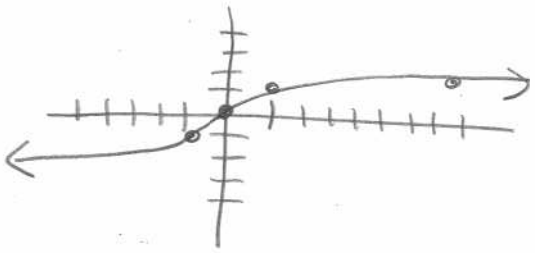
(53) A

(54) D

(55) C ($\frac{1}{x}$ type)

(56) $f(x) = \sqrt[3]{x}$

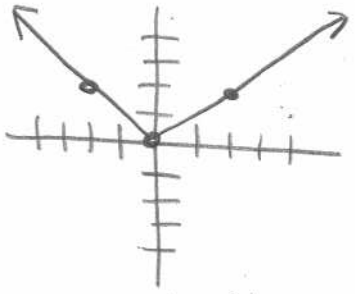
x	y
−8	−2
−1	−1
0	0
1	1
8	2



(57) $f(x) = |x|$

Shape = V

x	y
−2	2
−1	1
0	0
1	1
2	2



(58) $f(x) = \begin{cases} x+3 & \text{if } x<1 \\ 2 & \text{if } x \geq 1 \end{cases}$

$y = x+3$

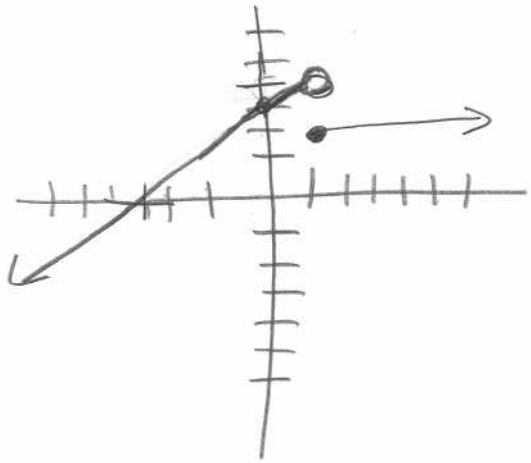
$x < 1$

x	y	
1	4	open
0	3	
−1	2	

$y = 2$

$x \geq 1$

x	y	
1	2	closed
2	2	
3	2	



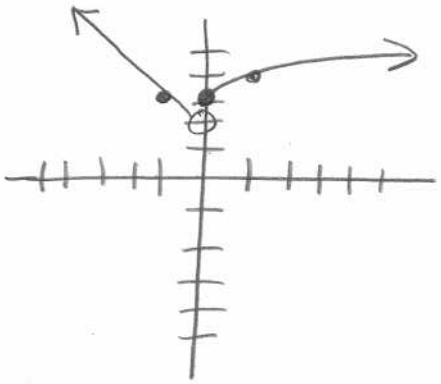
(59) $f(x) = \begin{cases} -x+2 & x<0 \\ \sqrt{x}+3 & x \geq 0 \end{cases}$

$f(x) = -x+2$, $x<0$

x	y	
0	2	open
-1	3	

$f(x) = \sqrt{x}+3$, $x \geq 0$

x	y	
0	3	closed
1	4	



(60) $f(x) = \begin{cases} 1 & \text{if } -2 \leq x < 5 \\ |x| & \text{if } 5 \leq x < 8 \\ \sqrt[3]{x} & \text{if } 8 \leq x \leq 12 \end{cases}$

$f(x) = 1$, $-2 \leq x < 5$

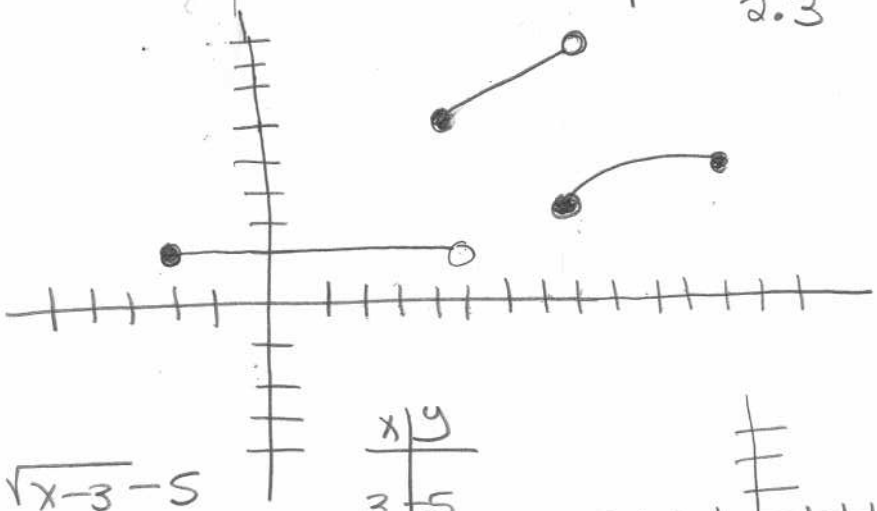
x	y	
-2	1	closed
5	1	open

$f(x) = |x|$, $5 \leq x < 8$

x	y	
5	5	closed
8	8	open

$f(x) = \sqrt[3]{x}$, $8 \leq x \leq 12$

x	y	
8	$\sqrt[3]{8} = 2$	closed
12	$\sqrt[3]{12} \approx 2.3$	closed



(61) $f(x) = \sqrt{x-3} - 5$

basic shape

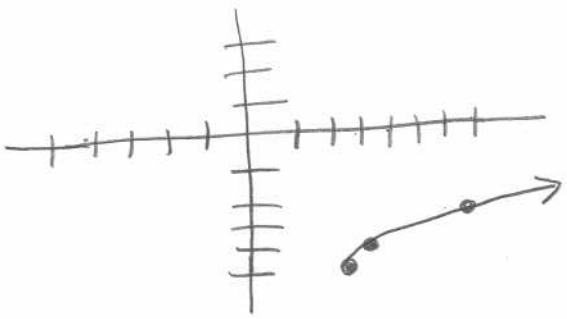
"vertex" = (3, -5)

$a = 1$ up

standard

x	y	
3	-5	
4	-4	
7	-3	

$+x$ opens R



(62) $f(x) = |x| + 5$

shape: V up
"vertex" (0,5) standardar

x	y
-1	6
0	5
1	6

(63) $f(x) = \frac{1}{x} + 5$

undefined at $x = 0$

x	y
-1	4
0	undef
1	6

(64) $f(x) = \frac{1}{3}x^3$

basic shape:
"vertex" (0,0)
$a = \frac{1}{3}$ "up" compressed

x	y
-3	-9
0	0
3	9

(65) – (68) & (70) on answer sheet

(69) $f(x) = 3(x+1)^2 - 2$

basic shape:
vertex: (-1, -2)
$a = 3$: up stretched

x	y
-2	1
-1	-2
0	1

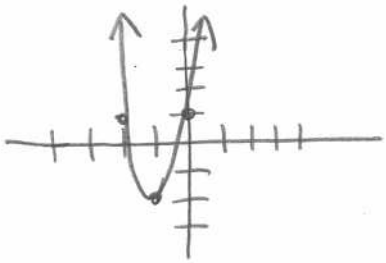
72 continued

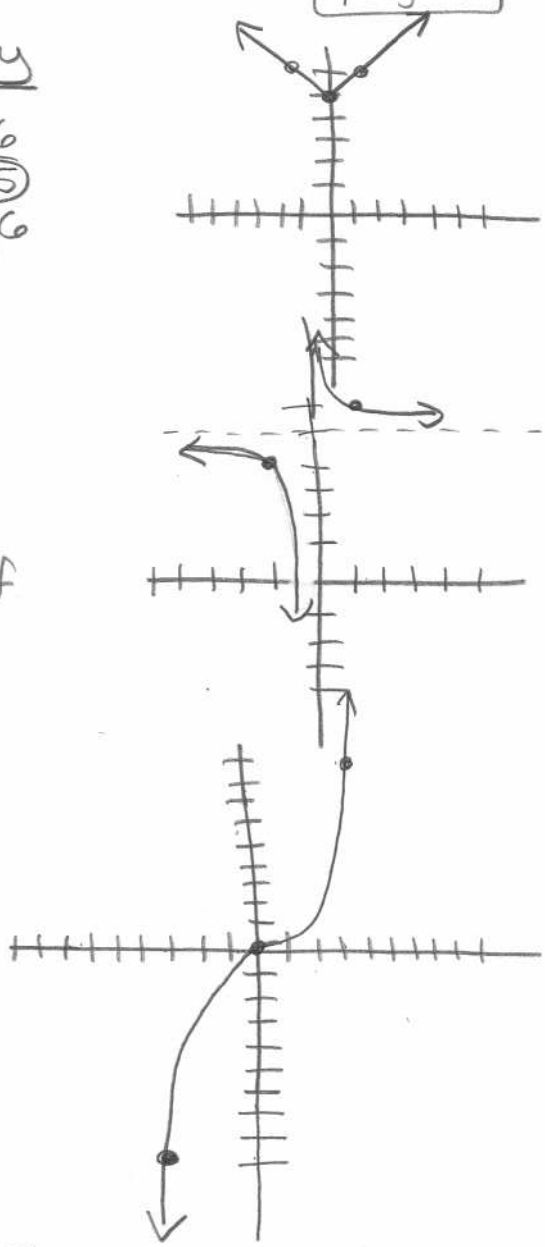
original

x	y
-3	-2
-1	1
3	-4

(new one)

-2	-1





(71) $f(x) = \sqrt{x+5} - 6$

basic shape
$a = 1$ up "vertex"
$+x$ R (-5, -6)

x	y
-5	-6
-4	-5

(72) $f(x+2) - 1$

shifting ("vertex") = (-2, -1)

(new shifted one) $\Rightarrow$ (-5, -3) & (1, -5)
(-3, 0)