P. 9-10

Lesson 1-1 HW (Day 1)

① $\{x \mid x > 50, x \in \mathbb{R}\}$

$(50, \infty)$

③ $\{x \mid x \leq -4, x \in \mathbb{R}\}$

$(-\infty, -4]$

⑤ $\{x \mid 8 < x < 99, x \in \mathbb{R}\}$

$(8, 99)$

⑦ $\{x \mid x < -19 \text{ or } x > 21, x \in \mathbb{R}\}$

$(-\infty, -19) \cup (21, \infty)$

⑨ $\{x \mid x = 0.25n, n \geq -1, n \in \mathbb{Z}\}$

Not possible in interval notation.

⑪ $\{x \mid x \leq -45 \text{ or } x > 86, x \in \mathbb{R}\}$

$(-\infty, -45] \cup (86, \infty)$

(13) $\{x \mid x = 5n, n \in \mathbb{Z}\}$

(15) function
(17) function
(19) function
(21) function $y = -\frac{4}{3}x + \frac{11}{3}$
(23) $y = \frac{x^2}{48}$ function

(25) function
(27) Not a function
(29) A) $\{(1,70),(2,75),(3,70),(4,62),(5,65)\}$

B) Yes. Exactly one estimated high temp. for each day. Same for the low temp.

(31) A) $h(4) = -3(4)^3 - 6(4) + 9 = -207$

B) $h(-2y) = -3(-2y)^3 - 6(-2y) + 9$
$= -3(-8y^3) + 12y + 9$
$= 24y^3 + 12y + 9$

C) $h(5b+3) = -3(5b+3)^3 - 6(5b+3) + 9$
$= -3(5b+3)(25b^2 + 30b + 9) - 30b - 18 + 9$

$= -3(125b^3 + 150b^2 + 45b + 75b^2 + 90b + 27) - 30b$
$-18+9$

$= -375b^3 - 450b^2 - 135b - 225b^2 - 270b$
$-81 - 30b - 18 + 9$

$= -375b^3 - 675b^2 - 435b - 90$

(33) $g(x) = \dfrac{3x^3}{x^2+x-4}$

A) $g(-2) = \dfrac{3(-2)^3}{(-2)^2-2-4} = \dfrac{-24}{-2} = 12$

B) $g(5x) = \dfrac{3(5x)^3}{(5x)^2+5x-4} = \dfrac{375x^3}{25x^2+5x-4}$

C) $g(8-4b) = \dfrac{3(8-4b)^3}{(8-4b)^2+8-4b-4}$

$(8-4b)(8-4b)$
$= 64 - 32b - 32b + 16b^3$
$= 64 - 64b + 16b^3$

$= \dfrac{3(8-4b)(64-64b+16b^3)}{64-64b+16b^2+8-4b-4}$

$= 3(512 - 512b + 128b^2 - 256b + 256b^2 - 64b^3)$

(35) A) $f(5) = -7 + \frac{6(5)+1}{5}$

$= -7 + \frac{31}{5} = -4/5$ or -0.8

B) $f(-8x) = -7 + \frac{6(-8x)+1}{-8x}$

$= -7 + \frac{-48x+1}{-8x}$

$= -7 + 6 - \frac{1}{8x}$

$= -1 - \frac{1}{8x}$

C) $f(6y+4) = -7 + \frac{6(6y+4)+1}{6y+4}$

$= -7 + \frac{36y+24+1}{6y+4}$

$= -7 + \frac{36y+25}{6y+4}$

(37) A) $t(-4) = 5\sqrt{6(-4)^2} = 5\sqrt{16 \cdot 6}$

$= 20\sqrt{6}$

b) $t(2x) = 5\sqrt{6(2x)^2}$

$= 5\sqrt{6 \cdot 4x^2} = 10x\sqrt{6}$

c) $t(7+n) = 5\sqrt{6(7+n)^2}$

$= 5|7+n|\sqrt{6}$

(34) $f(x) = \dfrac{8x+12}{x^2+5x+4}$

und when: $x^2+5x+4=0$

$(x+1)(x+4)=0$

$\{x \mid x \neq -1, x \neq -4, x \in \mathbb{R}\}$

or

$(-\infty, -4) \cup (-4, -1) \cup (-1, \infty)$

or

All $\mathbb{R}$ except $x \neq -1, -4$

(41) $g(a) = \sqrt{1+a^2}$

Defined when: $1+a^2 \geq 0$

Always positive!

All $\mathbb{R}$ or $(-\infty, \infty)$

(43) $f(a) = \dfrac{5a}{\sqrt{4a-1}}$

Domain: $4a-1 \geq 0$

$4a \geq 1$

$a \geq 1/4$

$[0.25, \infty)$ or

$\{x \mid x \geq 0.25, x \in \mathbb{R}\}$

(45) $f(x) = \frac{2}{x} + \frac{4}{x+1}$

und when: $x = 0$

$x = -1$

$\{x \mid x \neq 0, x \neq -1, x \in \mathbb{R}\}$

or

$(-\infty, -1) \cup (-1, 0) \cup (0, \infty)$

or

All $\mathbb{R}$ except $x \neq 0, -1$

(47) yes. Every x has one y.

$\frac{L}{9.8} \geq 0$ length must be positive

$L \geq 0$ D: $[0, \infty)$

(49) $f(-5) = (-5)^2 + -5 + 1$

$= 25 - 5 + 1$

$= 21$

$f(12) = (12)^2 + 12 + 1$

$= 144 + 12 + 1$

$= 157$

(51) $f(-5) = \sqrt{-5+6} = \sqrt{1} = 1$

$f(12) = \frac{2}{12} + 8 = \frac{49}{6}$

(53) A) 1999 $x=3$

$P(3) = 0.35(3) + 7.6$
$= 8.65$ million

2004 $x=8$
$P(8) = 0.04(8)^2 - 0.6(8) + 11.6$
$= 9.36$ million

B) D: $[0, 10]$

P. 10 - 11

Lesson 1-1 HW (Day 2)

54) Yes, passes VLT

55) NO, fails VLT

56) Yes, passes VLT

57) NO, fails VLT

58) A)

$$D(t) = \begin{cases} 4t & \text{if } 0 \le t \le 0.6 \\ 20t-(20-4)\cdot 0.6 & 0.6 < t \le 0.6+5.6 \\ 6t+(12)\cdot 6.2 & \end{cases}$$

B) $[0, 10.6]$

59) $\{x \mid x = 1792 + 4n, n \in \mathbb{W}\}$

60) The domain is the set of whole numbers from 0 to the capacity of stadium.

61) $D = \{x \mid x \ge 1874, x \in \mathbb{W}\}$

62) $D = \{t \mid 0 \le t \le 36, t \in \mathbb{R}\}$

$0 = 10{,}440 - 290t \rightarrow t = 36$

63) $f(a) = -5$

$f(a+h) = -5$

$$\frac{f(a+h)-f(a)}{h} = \frac{-5 - -5}{h} = \frac{0}{h} = 0$$

64) $f(a) = \sqrt{a}$

$f(a+h) = \sqrt{a+h}$

$$\frac{f(a+h)-f(a)}{h} = \frac{\sqrt{a+h} - \sqrt{a}}{h}$$

65) $f(x) = \frac{1}{x+4}$

$$f(a) = \frac{1}{a+4}$$

$$f(a+h) = \frac{1}{a+h+4}$$

$$\frac{f(a+h)-f(a)}{h} = \frac{\frac{1}{a+h+4} - \frac{1}{a+4}}{h}$$

$$= \frac{\frac{\cancel{a}+\cancel{4} - (\cancel{a}+h+\cancel{4})}{(a+h+4)(a+4)}}{h}$$

$$\frac{\frac{-h}{a^2+4a+ah+4h+4a+16}}{h}$$

$$= \frac{-\cancel{h}}{a^2+8a+ah+4h+16} \cdot \frac{1}{\cancel{h}}$$

$$= \frac{-1}{a^2+8a+ah+4h+16}$$

(66) $f(a) = \frac{2}{5-a}$

$$f(a+h) = \frac{2}{5-(a+h)} = \frac{2}{5-a-h}$$

$$\frac{f(a+h)-f(a)}{h} = \frac{\frac{2}{5-(a+h)} - \frac{2}{5-a}}{h}$$

$$= \frac{\frac{2}{5-a-h} - \frac{2}{5-a}}{h}$$

$$\frac{\frac{2(5-a)-2(5-a-h)}{(5-a-h)(5-a)}}{h}$$

$$\frac{\dfrac{\cancel{10}-\cancel{2a}-\cancel{10}+\cancel{2a}+2h}{25-5a-5a+a^2-5h+ah}}{h}$$

$$\frac{2\cancel{h}}{a^2-10a-5h+ah+25}\cdot\frac{1}{\cancel{h}}$$

$$\frac{2}{a^2-10a-5h+ah+25}$$

(67) $f(a)=(a)^2-6a+8$

$f(a+h)=(a+h)^2-6(a+h)+8$

$=a^2+2ah+h^2-6a-6h+8$

$$\frac{f(a+h)-f(a)}{h}=\frac{\cancel{a^2}+2ah+h^2-\cancel{6a}-6h+\cancel{8}-(a^2-6a+8)}{h}$$

$$=\frac{2ah+h^2-6h}{h}$$

$$=\frac{\cancel{h}(2a+h-6)}{\cancel{h}}$$

$$=2a+h-6$$

(69) $f(a) = -(a)^5$

$f(a+h) = -(a+h)^5$

$= -(a+h)(a^2+2ah+h^2)(a^2+2ah+h^2)$

$= -(a+h)(a^4+2a^3h+a^2h^2+4a^2h^2+2ah^3$
$+a^2h^2+2ah^3+h^4)$

$= -(a+h)(a^4+2a^3h+6a^2h^2+4ah^3+h^4)$

(71) $f(a) = 7a-3$

$f(a+h) = 7(a+h)-3$

$= 7a+7h-3$

$\frac{f(a+h)-f(a)}{h} = \frac{\cancel{7a}+7h-3-(\cancel{7a}-3)}{h}$

$= \frac{7h}{h} = 7$

(73) $f(a) = a^3$

$f(a+h) = (a+h)(a+h)(a+h)$

$= (a+h)(a^2+2ah+h^2)$

$= a^3+2a^2h+ah^2+a^2h+2ah^2+h^3$

$= a^3+3a^2h+3ah^2+h^3$

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

$\text{Aspect Ratio} = \frac{l}{h}$

75) A) $A(l) = \frac{l^2}{1.8}$; $[5, 11.5]$

B) $A(h) = 2.1h^2$; $[2.4, 5.5]$

C) $A(h) = 2.5h^2$

$A(5.5) = 2.5(5.5)^2$

$=$

76) A) $A = \pi r^2$

$C = 2\pi r$

$\frac{C}{2\pi} = r$

$A = \pi \cdot \left(\frac{C}{2\pi}\right)^2$

$= \frac{C^2 \cdot \cancel{\pi}}{4\pi^{\cancel{2}}} = \frac{C^2}{4\pi}$

B) $A(0.5) = 0.02$

$A(4) = 1.27$

C) As circm. increases, area increases.

77) No. most nonnegative x-values are paired with two y-values because it's necessary to take both + and − values of the abs. value of x when solving for y.

(78) yes. Each x-value is paired with exactly one y-value

$y = \sqrt[3]{x}$

(80) mason is

(81) $(-\infty, -3) \cup (-3, -1) \cup (-1, 5) \cup (5, \infty)$

$\{x \mid x \neq -3, x \neq -1, x \neq 5, x \in \mathbb{R}\}$

(~~82~~) $G(6) = G(5+1) = \dfrac{G(5-2) \cdot G(5-1) + 1}{G(5)}$

$= G(3) \cdot G(4)$

(83) True

(84) False

(85) False

(86) True

(87) If each input has exactly one output → function

(88) If no x-value repeats → function

(89) same

(90) VLT

(91) If each x-value can be paired with exactly one y-value after the equation is solved for y → function.

52) a) $T(7000) = 0.10 \cdot 7{,}000$
$= \$700$

$T(10{,}000) = 782.5 + 0.15(10{,}000)$
$= \$2{,}282.50$

$T(50{,}000) = 4{,}386.25 + 0.25(50{,}000)$
$= \$16{,}886.25$

b) $0.10 \cdot 7{,}285$
$= \$728.50$

58) a) $d = rt$

$2.4 = 4 \cdot t$ $\quad$ $112 = 20 \cdot t$ $\quad$ $26.2 = 6t$
$0.6 = t$ $\quad$ $5.6 = t$ $\quad$ $4.4 = t$

$$D(t) = \begin{cases} 4t \text{ if } 0 \le t \le 0.6 \\ 2.4 + 20(t - 0.6) \text{ if } 0.6 < t \le 6.2 \\ 2.4 + 112 + 6(t - 6.2) \text{ if } 6.2 < t \le 10.6 \end{cases}$$

$$D(t) = \begin{cases} 4t \text{ if } 0 \le t \le 0.6 \\ 20t - 9.6 \text{ if } 0.6 < t \le 6.2 \\ 6t + 77.2 \text{ if } 6.2 < t \le 10.6 \end{cases}$$

b) D : $[0, 10.6]$

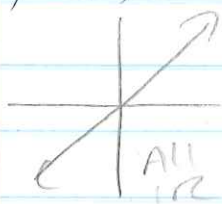
(64) $f(x) = \sqrt{x}$

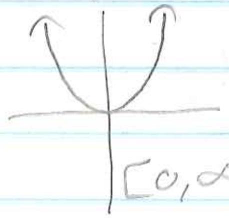
$f(a) = \sqrt{a}$

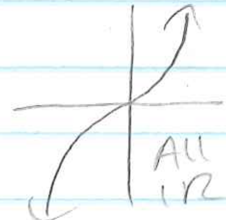
$f(a+h) = \sqrt{a+h}$

$\dfrac{f(a+h) - f(a)}{h} = \dfrac{\sqrt{a+h} - \sqrt{a}}{h}$

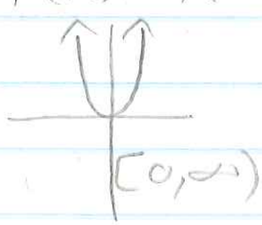
(79) a) $f(x) = x$ $\quad f(x) = x^2$ $\quad f(x) = x^3$

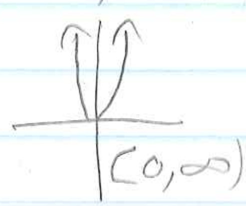






$f(x) = x^4$ $\quad f(x) = x^5$ $\quad f(x) = x^6$

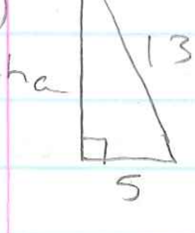




c) Range is $[0, \infty)$

d) Range is all $\mathbb{R}$ or $(-\infty, \infty)$

(107)



$h_a^2 + 5^2 = 13^2$

$h_a^2 = 144$

$h_a = 12$

These are similar △'s

$\dfrac{h_a}{13} = \dfrac{h_b}{8}$

$\dfrac{12}{13} = \dfrac{h_b}{8} \rightarrow h_b = \dfrac{96}{13}$