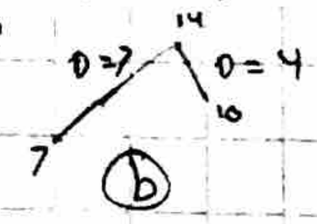
D = distance in units

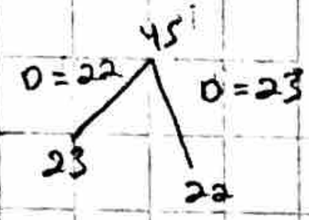
3a 7, 14, 10

14-7=7

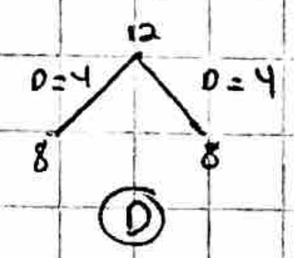
14-10=4



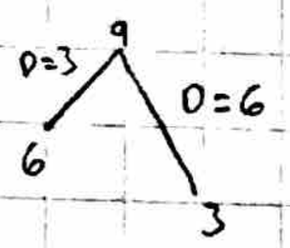
3b. 23, 45, 22



3c. 8, 12, 8



3d. 6, 9, 3



5a. C 5b. A 5c. B

7. $f(x) = x^2 + 3$

$f(1) = (1)^2 + 3$

$= 1 + 3$

$=$

7a. $f(1) = 4$

$g(x) = \sqrt{x-5}$

$g(1) = \sqrt{1-4}$

$= \sqrt{-3}$

$=$

$g(1) =$ nonreal

$H(x) = \frac{x}{x-2}$

$H(1) = \frac{1}{1-2}$

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

$= -1$

undef

7c. $f(3x) = (3x)^2 + 3$

$= 9x^2 + 3$

$= 3(3x^2 + 1)$

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

$3x - 5 \geq 0$

$+5 \quad +5$

$\frac{3x}{3} \geq \frac{5}{3}$

where, $x \geq 5/3$

$H(3x) = \frac{3x}{3x-2}$

$3x - 2 \neq 0$

$+2 \quad +2$

$\frac{3x}{3} \neq \frac{2}{3}$

$x \neq 2/3$

∴ Domain

$-\infty < 2/3 < \infty$

$(-\infty, 2/3) \cup (2/3, \infty)$

7d. $f(x+h) = (x+h)^2 + 3$

$(x+h)(x+h) + 3$

$x^2 + hx + hx + h^2 + 3$

$x^2 + 2hx + h^2 + 3$

$g(x+h) = \sqrt{x+h-5}$

$H(x+h) = \frac{x+h}{x+h-2}$

9a. $P = (1, 5)$

$Q = (2, 7)$

$m = \frac{7-5}{2-1}$

$m = \frac{2}{1}$

$m = 2$

9b. $P = (x, x^2 + 3x - 1)$

$Q = (x+h, (x+h)^2 + 3(x+h) - 1)$

$[(x+h)^2 + 3(x+h) - 1] - [x^2 + 3x - 1]$

$x^2 + 2hx + h^2 + 3x + 3h - 1 - x^2 - 3x + 1$

$x^2 - x^2 + 2hx + h^2 + 3x - 3x + 3h + 1 + 1$

$h^2 + 2hx + 3h$

$x + h - x$

$\frac{h^2 + 2hx + 3h}{h}$

$\frac{h(h + 2x + 3)}{h}$

$m = h + 2x + 3$

$(x+h)(x+h)$

$x^2 + hx + hx + h^2$

$x^2 + 2hx + h^2$

11.

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

$=$

$f(x+h) = (x+h)^2 - 2(x+h)$

$$\frac{f(x+h) - f(x)}{h}$$

$=$

$$\frac{(x+h)^2 - 2(x+h) - (x^2 - 2x)}{h}$$

$=$

$(x+h)(x+h) - 2x - 2h - x^2 + 2x$

$=$

$x^2 + hx + hx + h^2 - 2x - 2h - x^2 + 2x$

$=$

$x^2 + 2hx + h^2 - 2x - 2h - x^2 + 2x$

$=$

$\cancel{x^2 - x^2} + h^2 + 2hx \boxed{- 2x + 2x} - 2h$

$=$

$\boxed{h^2 + 2hx - 2h}$

$\downarrow$

$$\frac{h^2 + 2hx - 2h}{h}$$

$=$

$$\frac{\cancel{h}(h + 2x - 2)}{\cancel{h}}$$

$=$

$\boxed{h + 2x - 2 \quad \text{or} \quad 2x + h - 2}$

$$\boxed{\frac{f(x+h) - f(x)}{h} = 2x + h - 2 \quad \text{for} \quad f(x) = x^2 - 2x, \quad h \neq 0}$$

$a = x, \; 2a + h - 2$

$a = 1$

$2(1) + h - 2$

$=$

$2 + h - 2$

$=$

(h)

$a = 2$

$2(2) + h - 2$

$=$

$4 + h - 2$

$=$

$(2 + h)$

$a = 3$

$2(3) + h - 2$

$=$

$6 + h - 2$

$=$

$(4 + h)$

$a = x$

$2(x) + h - 2$

$(2x + h - 2)$

11. $g(x) = \sqrt{x}$

$g(x+h) = \sqrt{x+h}$

$$\frac{g(x+h) - g(x)}{h}$$

$$\Downarrow$$

$$\frac{\sqrt{x+h} - \sqrt{x}}{h}$$

$$\Downarrow$$

$a = x$

$$\Downarrow$$

$$\frac{\sqrt{a+h} - \sqrt{a}}{h}, \quad h \neq 0$$

$a=1$

$$\frac{\sqrt{1+h} - \sqrt{1}}{h}$$

$a=2$

$$\frac{\sqrt{2+h} - \sqrt{2}}{h}$$

$a=3$

$$\frac{\sqrt{3+h} - \sqrt{3}}{h}$$

$a=x$

$$\frac{\sqrt{x+h} - \sqrt{x}}{h}$$

13a. 1pm 2pm

Approx 250 375

13b. $[0, 1]$

$f(a)$ $f(b)$

$f(0) = 0$, $f(1) = 250$

$$\frac{250 - 0}{1 - 0}$$

$$\Downarrow$$

$$250$$

13c. Flying in a circle

Landing at another airport

15a. Check solutions

15b. $x = 2, x = 4$

15c. $x=1(4/5, 14/5)\ (1,2) = 6$

$x=2(14/5, 3)\ (2,3) = 0$

$x=3(2.4/5, 2 1/5)\ (3,2) = 9$

$x=4\ (34/5, 1)\ (4,1) = 0$

$x=5\ (4.4/5, 12/5)\ (5,2) = 3$

Smallest: $x=2$ and $x=4$

Largest: $x=1$

19. $f(x) = x + 1$ $s(x) = m$ for $(0,0)$ and $(x, f(x))$

a. $s(1)$ $x = 1, f(x) = 2$

$(0,0)$ $(1,2)$

$m = \frac{2-0}{1-0}$

$= \frac{2}{1}$

$= 2$

$\boxed{m = 2}$

$s(3)$ $x = 3, f(3) = 4$

$(0,0)$ $(3,4)$

$m = \frac{4-0}{3-0}$

$= \frac{4}{3}$

$s(4)$ $x = 4, f(4) = 5$

$(0,0)$ $(4,5)$

$m = \frac{5-0}{4-0}$

$= \frac{5}{4}$

b. $s(x) = \frac{f(x) = x+1}{x}$

$\frac{x+1-0}{x-0}$

$= \frac{x+1}{x}$

$\boxed{s(x) = \frac{x+1}{x}}$

21.

x	f(x)	g(x)
0	1	1
1	2	1
2	2	-1
3	1	0
4	1.5	

$g(x) = m$, Interval at 1/4

$x = 1 \quad f(x) = 2$

(1, 2) (2, 3)

$g(x) = \frac{3-2}{2-1}$

$= \frac{1}{1}$

$g(x) = 1$

$x = 3 \quad f(x) = 1$

Horizontal line

$g(x) = 0$

$x = 4, \quad f(x) = 0.5$

(4, 0.5) (3.75, 1.5)

$x = 0 \quad f(x) = 1$

(0, 0) (1, 1)

$g(x) = \frac{1-0}{1-0}$

$= 1$

$g(x) = 1$

$x = 2 \quad f(x) = 2$

(2, 2) (1.75, 2.25)

$g(x) = \frac{2.25-2}{1.75-2}$

$= -1$

$g(x) = -1$