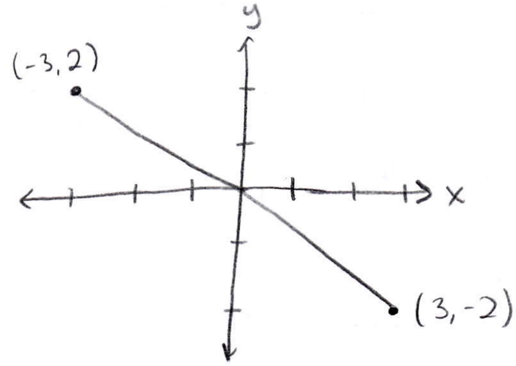
1.1 # 4, 26, 34, 38

4) Plot $(-3,2), (3,-2)$



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

$$= \sqrt{36+16}$$

$$= \sqrt{52}$$

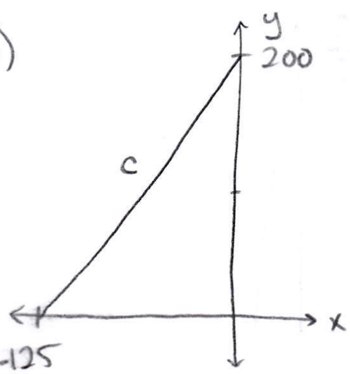
$$= 7.211$$

Midpoint:

$$M = \left(\frac{3-3}{2}, \frac{-2+2}{2}\right)$$

$$= (0, 0)$$

26)



$(0,200)$

$$c = \sqrt{(125)^2 + (-200)^2}$$

$$\approx 235.85 \text{ ft}$$

$(-125, 0)$

34)

Year	2001	2003	2005
Value (millions)	3320	?	4526

$$M = \left(\frac{2001+2005}{2}, \frac{4526+3320}{2}\right)$$

$$= (2003, 3923)$$

The increase is linear if the true value is ≈ 3923 million

38) a) $X =$ time, $Y =$ smokers

Decreasing trend, $\approx$ linear 2001 – 2004

b) $X =$ time, $Y =$ drinkers

No clear trend

c) $X =$ drink, $Y =$ smoke

No clear trend

$\boxed{1.2}$ # 12, 42, 62, 66

12) $4x - 2y - 5 = 0$

X-intercept

$4x = 2y + 5$

$x = \frac{2y+5}{4}$

$x = \frac{2(0)+5}{4} = \frac{5}{4}$

$\left(\frac{5}{4}, 0\right)$

Y-intercept

$2y = 4x - 5$

$y = \frac{4x-5}{2}$

$y = \frac{4(0)-5}{2} = -\frac{5}{2}$

$\left(0, -\frac{5}{2}\right)$

42) Center: $(3, -2)$ Soln pt: $(-1, 1)$

$r = \sqrt{(-1-3)^2 + (1-(-2))^2}$

$r^2 = 16 + 9$

$= 25$

$25 = (x-3)^2 + (y+2)^2$ standard form

$25 = x^2 - 6x + 9 + y^2 + 4y + 4$

$0 = x^2 - 6x + 9 + y^2 + 4y + 4 - 25$

$0 = x^2 + y^2 - 6x + 4y - 12$ general form

62) $L = 0.42t + 109$ $\qquad W = 0.8t + 60$

Age	0	a	b	c	45	d
Length	e	111.1	f	117.82	g	h
Weight	i	j	68	k	l	108

$L = 0.42t + 109$

$$t_L(L) = \frac{L-109}{0.42} = 2.381L - 259.524$$

$W = 0.8t + 60$

$$t_W(W) = \frac{W-60}{0.8} = 1.25W - 75$$

$a = t_L(111.1) = 5$

$b = t_W(68) = 10$

$c = t_L(117.82) = 21$

$d = t_W(108) = 60$

$e = L(0) = 109$

$f = L(b) = L(10) = 113.2$

$g = L(45) = 127.9$

$h = L(d) = L(60) = 134.2$

$i = W(0) = 60$

$j = W(a) = W(5) = 64$

$k = W(c) = W(21) = 76.8$

$l = W(45) = 96$

66) $y = -0.8t^2 + 18.16t + 350$

a)

Year $(t+2000)$	2001	2002	2003	2004	2005	2008
Salary (\$)	367.36	383.12	397.28	409.84	420.80	444.08

b) There is a very strong linear trend, but extrapolating is dangerous in general. E.g., consider the 2008 financial crash. Is 2008 likely to maintain the linear trend?

c) For 2010, predicts 451.6. Same comment as (b).

1.3 # 30, 38, 60, 92

30) $2x + 3y = 9$

$3y = 9 - 2x$

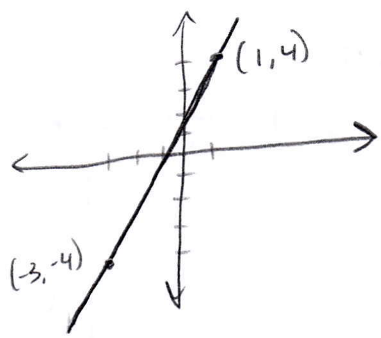
$y = 3 - \frac{2}{3}x$

Slope: $m = -\frac{2}{3}$

Y-intercept: $(0, 3)$

38) Points $(-3, -4)$ and $(1, 4)$

$m = \frac{\Delta y}{\Delta x} = \frac{4-(-4)}{1-(-3)} = \frac{8}{4} = 2$



$y - y_0 = m(x - x_0)$

$y + 4 = 2(x + 3)$

$y = 2x + 6 - 4$

$y = 2x + 2$

60) $(0,4)$, $(7,-6)$, $(-5,11)$

If the slope b/w $(0,4)$ and $(7,-6)$ is the same as the slope b/w $(0,4)$ and $(-5,11)$ then the points will be collinear.

92) At age 1, brain wt = 970 g

At age 3, brain wt = 1270g

a) $(1, 970)$, $(3, 1270)$

$m = \frac{1270-970}{3-1} = \frac{300}{2} = 150$

$W - W_0 = m(t - t_0)$

$W - 970 = 150(t-1)$

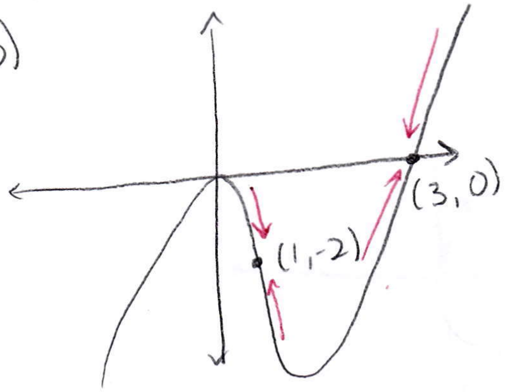
$W = 150t - 150 + 970$

$W = 150t + 820$

1.5 # 4, 10, 14, 32, 70

4) $\lim_{x \to 2} \frac{x-2}{x^2-3x+2} = 1$

x	1.9	1.99	1.999	2	2.001	2.01	2.1
f(x)	1.111	1.010	1.001	?	0.999	0.991	0.909

10) 

a) $\lim_{x \to 1} f(x) = -2$

b) $\lim_{x \to 3} f(x) = 0$

14) $\lim_{x \to c} f(x) = \frac{3}{2}$ $\lim_{x \to c} g(x) = \frac{1}{2}$

a) $\lim_{x \to c} (f(x) + g(x)) = \frac{3}{2} + \frac{1}{2} = 2$

b) $\lim_{x \to c} (f(x) g(x)) = \frac{3}{2} \cdot \frac{1}{2} = \frac{3}{4}$

c) $\lim_{x \to c} \left(\frac{f(x)}{g(x)}\right) = \frac{3}{2} \Big/ \frac{1}{2} = 3$

32) $\lim_{x \to -2} \frac{3x+1}{2-x} = \frac{3(-2)+1}{2-(-2)} = \frac{-5}{4}$

70) $C = \frac{25000p}{100-p}$ $0 \leq p < 100$

a) $p = 50$

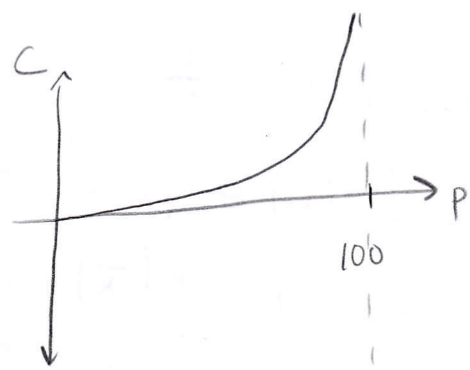
$C = \frac{25000(50)}{50} = 25{,}000$ dollars.

b) For \$100,000, $100{,}000 = \frac{25{,}000p}{100-p}$

$100(100-p) = 25p$

$10{,}000 = 25p + 100p = 125p$

$p = 80\%$

c) 

$\lim_{p \to 100} C = \infty$

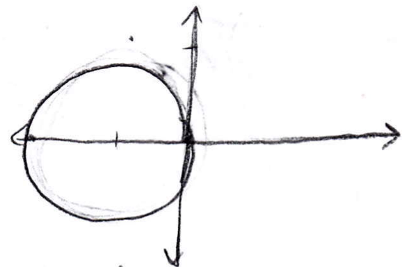
b) At age $t=2$, $y = 150(2) + 820$
$= 1120$

d) <u>NO</u> this is an extrapolation - these must be approached with extreme caution. Since we do not have data on what's happening outside of $1 \le t \le 3$.

1.4 # 6, 30, 42, 68

6) $x^2 + y^2 + 2x = 0$

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



This is a circle centered at $(-1,0)$ and NOT a function.

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

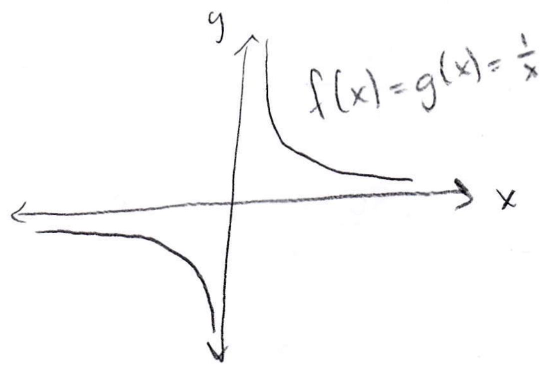
$$\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{\frac{1}{(x+\Delta x)+4} - \frac{1}{x+4}}{\Delta x}$$

$$= \frac{(x+4) - (x+\Delta x+4)}{\Delta x(x+4)(x+\Delta x+4)}$$

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

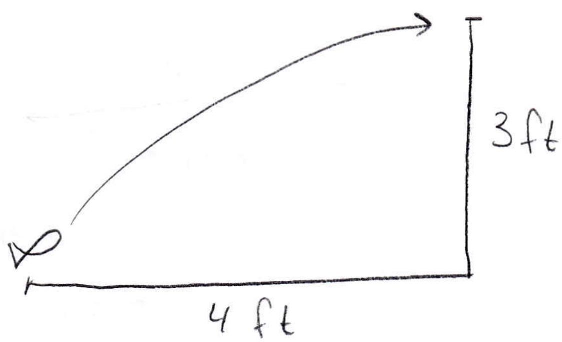
42) $f(x) = \frac{1}{x}$ $\quad g(x) = \frac{1}{x}$

$$f(g(x)) = f\left(\frac{1}{x}\right) = \frac{1}{1/x} = x$$
$$g(f(x)) = g\left(\frac{1}{x}\right) = \frac{1}{1/x} = x$$



68) $h = -0.42x^2 + 2.52x$
$h = -0.42(4)^2 + 2.52(4)$
$= 3.36$

yes.



1.6 # 18, 36, 46, 60, 66

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

Discontinuity at $x^2 - 9 = 0$

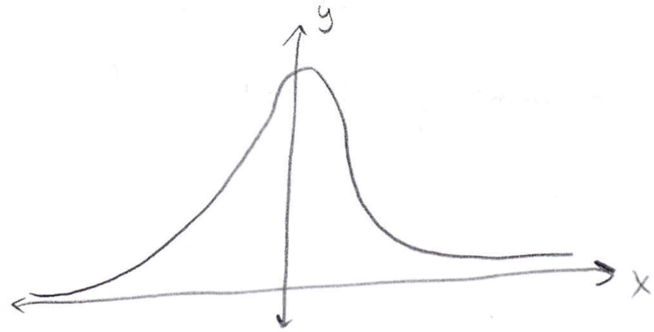
$x^2 = 9$

$x = \pm 3$

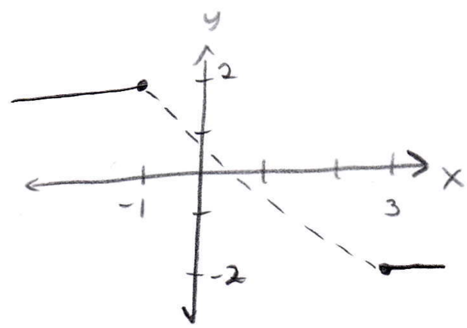
Continuous on $(-\infty, -3) \cap (-3, 3) \cap (3, \infty)$

36) $f(x) = \dfrac{5}{x^2+1}$ on $[1, 4]$

Continuous on $[1, 4]$



46) $f(x) = \begin{cases} 2 & x \leq -1 \\ ax+b & -1 < x < 3 \\ -2 & x \geq 3 \end{cases}$



For continuity, $ax+b$ must connect $(-1, 2)$ and $(3, -2)$.

$m = \dfrac{\Delta y}{\Delta x} = \dfrac{-4}{4} = -1$

$y - y_0 = m(x - x_0)$

$y - 2 = -1(x+1)$

$y = -x - 1 + 2$

$y = -x + 1$

So $a = -1$, $b = 1$

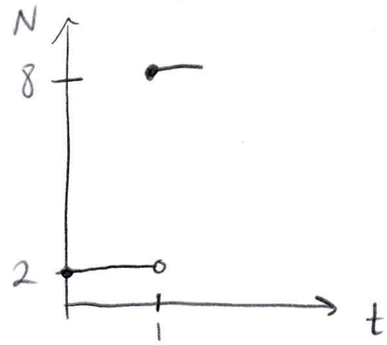
60) $C = \dfrac{2x}{100-x}$

a) The implied domain of C is $0 \leq x < 100$ since it is only possible to remove b/w 0 and 100% (inclusive). 100 is not included since there is a discontinuity at this point.

b) Yes, unless you include 100 in the implied domain.

c) $C = \frac{2(75)}{100-75} = \frac{150}{25} = 6$ million \$

66) The key here is that we begin with two rabbits.



At time $t=1$, our pair of rabbits has babies and the function jumps from $N=2$ to $N=8$. There will be a jump each time a rabbit gives birth (or dies).