

Chapter 0

Sect 0.1

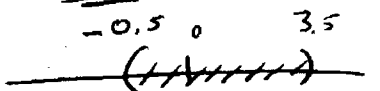
#11 $5x - 12 > 0$

(a) $x=3$ $5(3) - 12 = 3 > 0$ true

(b) $x=-3$ $5(-3) - 12 = -27 > 0$ false

(c) $x=\frac{5}{2}$ $5(\frac{5}{2}) - 12 = \frac{1}{2} > 0$ true

(d) $x=\frac{3}{2}$ $5(\frac{3}{2}) - 12 = -\frac{9}{2} > 0$ false

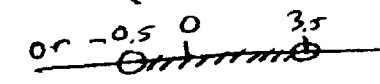


#21 $-4 < 2x - 3 < 4$
 $+3$ $+3$

$-1 < 2x < 7$

#2 $-\frac{1}{2} < x < \frac{7}{2}$

or $-0.5 < x < 3.5$



Sect 0.2

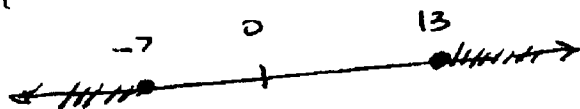
#14 $(-\infty, 20) \cup (24, \infty)$

centered at $\frac{20+24}{2} = 22$

radius is $22-20 = 24-22 = 2$

$\therefore |x-22| > 2$ (end pts. not included)

#25 $|\frac{x-3}{2}| \geq 5$ or $|x-3| \geq 10 \Rightarrow$
 $x-3 \geq 10 \Rightarrow x \geq 13$
 or $x-3 \leq -10 \Rightarrow x \leq -7$



Sect 0.3

#11 $\sqrt[3]{x^2}$ at $x=27$ is $\sqrt[3]{(27)^2} = (27)^{2/3} = (\sqrt[3]{27})^2 = 3^2 = 9$

#21 $6y^{-2} (2y^4)^{-3} = \frac{6y^{-2}}{2^3 (y^4)^3} = \frac{6y^{-2}}{8y^{12}} = \frac{3}{4} y^{-14}$ or $\frac{3}{4y^{14}}$

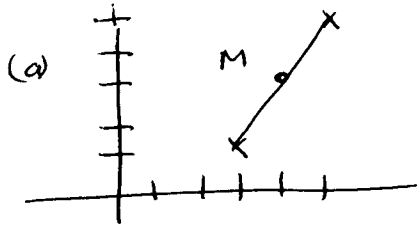
#49 $f(x) = \frac{1}{\sqrt[3]{x-4}}$ since odd root (3) only $x-4=0$ is a problem
 $\therefore D: (-\infty, 4) \cup (4, \infty)$

#51 $f(x) = \frac{\sqrt{x+2}}{1-x}$ here $x+2 \geq 0 \Rightarrow x \geq -2$
 and $1-x \neq 0 \Rightarrow x \neq 1 \Rightarrow \underline{\underline{[-2, 1) \cup (1, \infty)}}$

Chap 1

sect 1.1

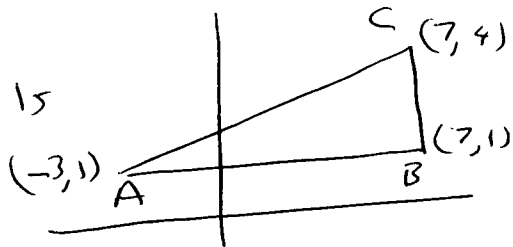
#3



(b) $d = \sqrt{(5-3)^2 + (5-1)^2} = \sqrt{4+16} = \sqrt{20}$

(c) $M = \left(\frac{3+5}{2}, \frac{1+5}{2}\right) = (4, 3)$

#15



$|AB| = 7 - (-3) = 10$

$|BC| = 4 - 1 = 3$

$|AC| = \sqrt{[7 - (-3)]^2 + [4 - 1]^2} = \sqrt{100 + 9} = \sqrt{109}$

$(\sqrt{109})^2 = 109$

$10^2 + 3^2 = 100 + 9 = 109$

Satisfies Pythagorean Theorem

#21 $d = 5$ $(1, 0), (x, -4)$

$(x-1)^2 + (-4-0)^2 = 5^2$

$(x-1)^2 + 16 = 25$

$(x-1)^2 = 9$

or $\left. \begin{array}{l} x-1 = +3 \\ x-1 = -3 \end{array} \right\} \Rightarrow \left. \begin{array}{l} x = 4 \\ \text{or } x = -2 \end{array} \right\}$

#30 (a) $\left. \begin{array}{l} \text{March 2005 } 10,800 \\ \text{Nov 2005 } 10,400 \end{array} \right\} -400$

$-400 / 10,800 = -3.70\%$

(b) $\left. \begin{array}{l} \text{May 2006 } 11,400 \\ \text{Feb 2007 } 12,600 \end{array} \right\} +1200$

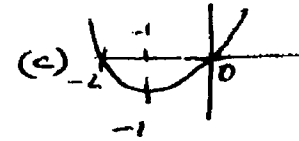
$1200 / 11,400 = +10.53\%$

Sect 1.2

#3 $x^2 + y^2 = 4$

(a) $(1, -\sqrt{3})$ $1^2 + (-\sqrt{3})^2 = 1 + 3 = 4$ true
 (b) $(\frac{1}{2}, -1)$ $(\frac{1}{2})^2 + (-1)^2 = \frac{1}{4} + 1 = 1.25$ false
 (c) $(\frac{3}{2}, \frac{3}{2})$ $(\frac{3}{2})^2 + (\frac{3}{2})^2 = \frac{9}{4} + \frac{9}{4} = \frac{18}{4}$ false

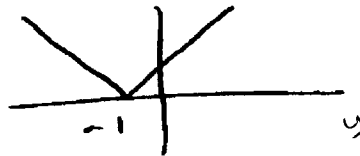
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#7 $y = x^2 + 2x \Rightarrow$ 

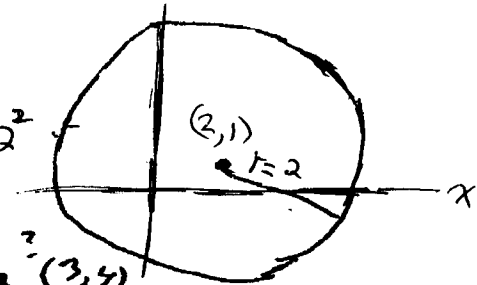
#13 $y = x^2 + x - 2 = (x+2)(x-1) = 0$ at $x=0$ $y=-2$ intercepts
 roots at $1, -2$ $(0, -2)$
 $(1, 0), (-2, 0)$

#31 $y = |x+1|$

x	y
-3	2
-2	1
-1	0
0	1
1	2

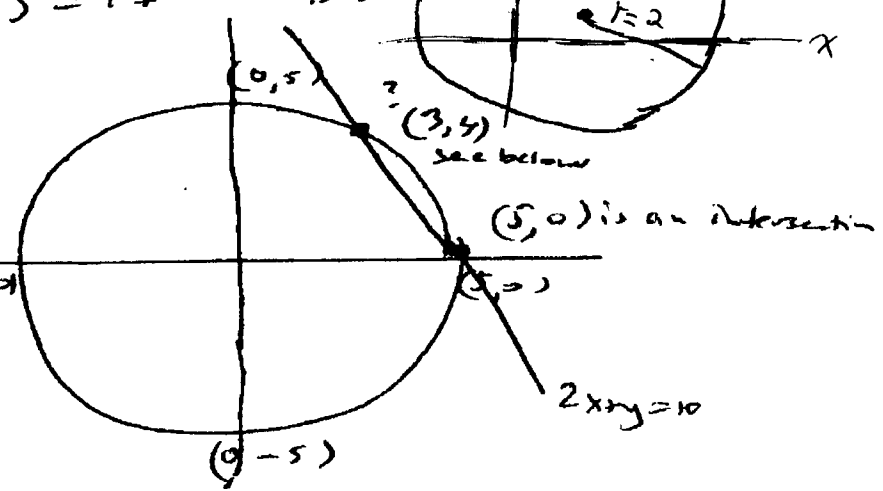


#47 $x^2 + y^2 - 4x - 2y + 1 = 0$
 $(x-2)^2 + (y-1)^2 = 4 + 1 - 1 = 4 = 2^2$



#55 $x^2 + y^2 = 25$
 $2x + y = 10$

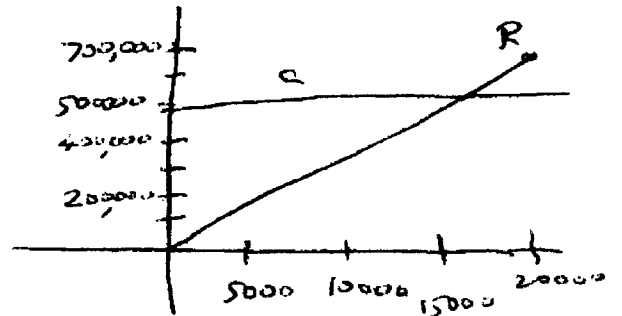
$x^2 + (10-2x)^2 = 25$
 $5x^2 - 40x + 100 = 25$
 $5x^2 - 40x + 75 = 0$
 $x^2 - 8x + 15 = 0$
 $(x-5)(x-3) = 0$



$\therefore x=3 \Rightarrow y=10-2(3)=4$

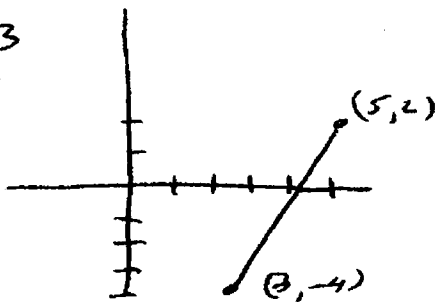
#64 $C = 6x + 500,000$
 $R = 35x$

$C = R \Rightarrow 6x + 500,000 = 35x$
 $500,000 = 29x$
 $x = \frac{500,000}{29} = 17,241.4$



Sect 1.3

#7



$$m = \frac{2 - (-4)}{5 - 0} = \frac{6}{5} = \boxed{\frac{6}{5}}$$

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#23

$$y - 7 = -3(x - 1) = -3x + 3$$

$$\Rightarrow \underline{y = -3x + 10}$$

points include:

$$(0, 10), (2, 4)$$

$$(-2, 16) \text{ etc.}$$

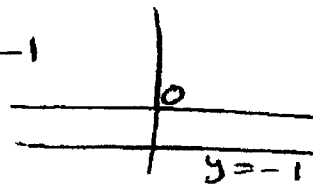
#43

$$(3, -1), (-2, -1)$$

$$y = 0(x + 2) - 1 = -1$$

$$m = \frac{-1 - (-1)}{-2 - 3} = 0$$

$$\therefore y = -1$$



#59

$$A \quad B \quad C$$

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

$$m_{AB} = \frac{0 - 1}{-1 - (-2)} = \frac{-1}{1} = -1$$

$$m_{BC} = \frac{-2 - 0}{2 - (-1)} = \frac{-2}{3}$$

} \neq !!
not collinear

also $d_{AB} = \sqrt{[-1 - (-2)]^2 + (0 - 1)^2} = \sqrt{2}$

$$d_{BC} = \sqrt{[2 - (-1)]^2 + (-2 - 0)^2} = \sqrt{13}$$

$$d_{AC} = \sqrt{[2 - (-2)]^2 + (-2 - 1)^2} = \sqrt{25} = 5$$

note:

$$\sqrt{2} + \sqrt{13} \neq 5$$

\therefore not collinear

#87

t	y
2000	4,024
2005	4,255

$$t = 0 \Leftrightarrow 1990$$

$$(a) \quad m = \frac{4,255 - 4,024}{5 - 0} = \frac{231}{5} = 46.2$$

\therefore pop. growing by 46,200 per yr.

$$(b) \quad y - 4,024 = 46.2(x - 0) \Rightarrow \boxed{y = 46.2x + 4,024}$$

$$y(2) = 46.2(2) + 4,024 = \boxed{4,116.4} \text{ or } 4,116,400$$

$$(c) \quad y(4) = 46.2(4) + 4,024 = \boxed{4,208.8} \text{ or } 4,208,800$$

(d) — by text — actual? $\frac{4,024,000}{4,198,000}$ } note — census only every 10 yrs

(e) it might be low if pop is growing exponentially (\curvearrowright) rather than linearly (\rightarrow)

Sect 1.4

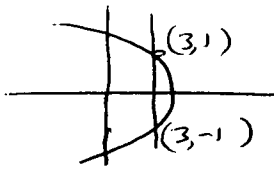
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#2 $x+y^2=4$
 or $x=4-y^2$

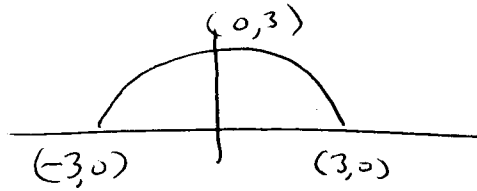
This is not a function because both $(3, 1)$ and $(3, -1)$ are pts. on this curve

fails vertical line test



note: #5 $x^2+y=4$ is  and is a function

#12 $y = f(x) = \sqrt{9-x^2}$
 same as $y^2 = 9-x^2$
 or $x^2+y^2=9$

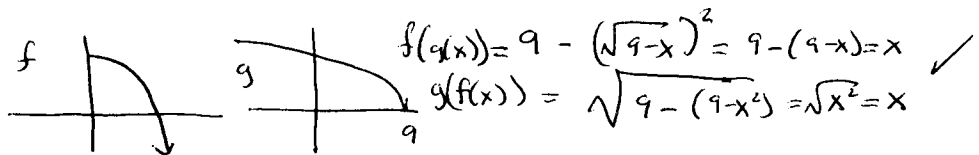


Semi-circle

#27 $g(x) = \sqrt{x+1}$

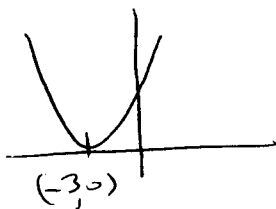
$$\frac{g(x+\Delta x) - g(x)}{\Delta x} = \frac{\sqrt{x+\Delta x+1} - \sqrt{x+1}}{\Delta x}$$

#43 $f(x) = 9-x^2, x \geq 0$
 $g(x) = \sqrt{9-x}, x \leq 9$



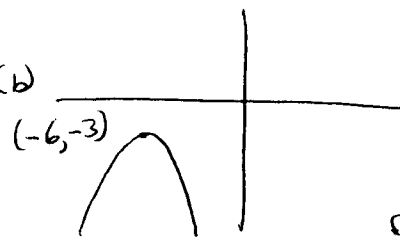
$f(g(x)) = 9 - (\sqrt{9-x})^2 = 9 - (9-x) = x$ ✓
 $g(f(x)) = \sqrt{9 - (9-x^2)} = \sqrt{x^2} = x$

#61 (a)



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

(b)



first $y = -x^2$
 then move to new vertex

$y+3 = -(x+6)^2$

or $y = -(x+6)^2 - 3$

#72 (a) $C = \$98,000 + 12.30x$

$\$98,000 = \text{fixed cost}$ $\$12.30 = \text{variable cost}$

(b) $R = \$17.98x$

variable $x = \text{no. of units produced \& sold}$

(c) $P = R - C = 98,000 + 12.30x - 17.98x = 98,000 - 5.68x$

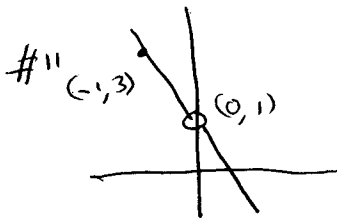
(note $P=0$ at $x = \frac{98,000}{5.68} = 17,253.5$ \therefore profit is positive for $x \geq 17,254$)

Sect 1.5

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#5 $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$

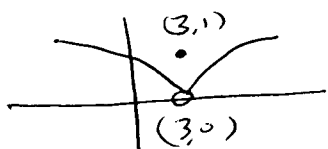
x	-0.1	-0.01	-0.001	+0.001	0.01	0.1
f(x)	0.513	0.501	0.50012	0.49988	0.499	0.488



(a) $\lim_{x \rightarrow 0} g(x) = 1$ $g(0)$ D.N.E.

(b) $\lim_{x \rightarrow -1} g(x) = 3$ note: here $g(-1) = 3$ as well

#19



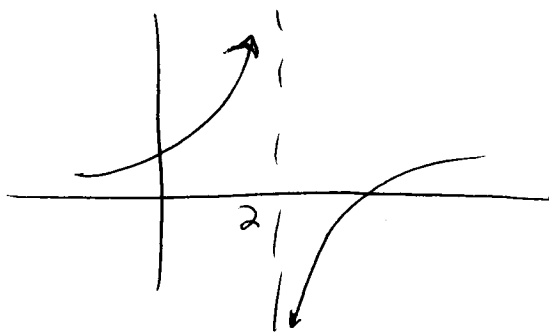
(a) $\lim_{x \rightarrow 3^+} f(x) = 0$
 (b) $\lim_{x \rightarrow 3^-} f(x) = 0$ } $\Rightarrow \lim_{x \rightarrow 3} f(x) = 0$
 (however $f(3) = 1$)

#29 $\lim_{x \rightarrow 3} \sqrt{x+6} = \sqrt{3+6} = \sqrt{9} = 3$ since $x=3$ is a pt. of continuity

#35 $\lim_{x \rightarrow 7} \frac{5x}{x+2} = \frac{5(7)}{7+2} = \frac{35}{9}$ same as $f(7)$ since this is a pt. of continuity

#49 $\lim_{x \rightarrow -2} \frac{|x+2|}{x+2}$ Consider $x = -2.01$ $\frac{|-0.01|}{-0.01} = -1$
 $x = -1.99$ $\frac{|0.01|}{0.01} = +1$ } \Rightarrow there is no limit as $x \rightarrow 0$

#65 $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 4x + 4} = \lim_{x \rightarrow 2} \frac{(x-2)(x-3)}{(x-2)(x-2)} = \lim_{x \rightarrow 2} \frac{x-3}{x-2}$ is ∞



Sect 1.6

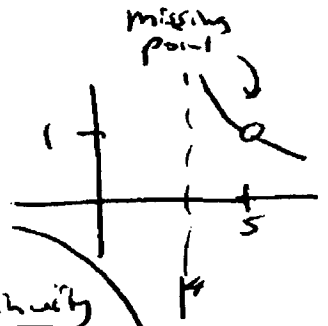
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#3 $f(x) = \frac{1}{x^2-4}$ is not continuous for $x=2$ or $x=-2$

#7 $f(x) = \frac{2x-1}{x^2-8x+15}$ is not continuous when $x^2-8x+15 = (x-3)(x-5) = 0$
 that is, $x=3$ or $x=5$

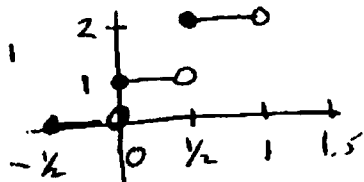
#21 $f(x) = \frac{x-5}{x^2-9x+20} = \frac{x-5}{(x-4)(x-5)} = \begin{cases} \frac{1}{x-4} & x \neq 5, 4 \\ \text{undef / at } x=5 \end{cases}$

is not continuous at $x=4$ or $x=5$



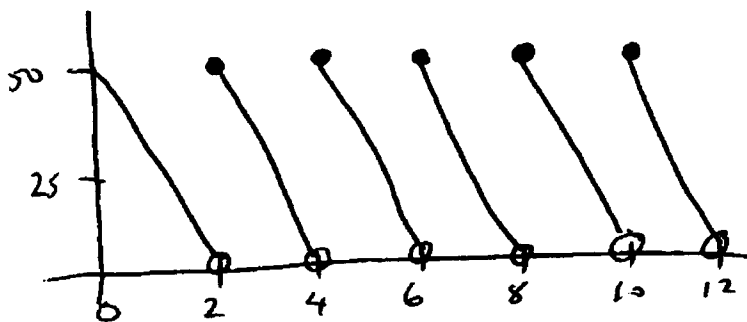
note as shown $x=5$ is a removable discontinuity
 that is, if $(5, 1)$ is filled in the function would be
 continuous at $x=5$ $\bullet \rightarrow (-\infty, 4) \cup (4, 5) \cup (5, \infty)$

#23 $f(x) = \lceil \lceil 2x \rceil \rceil + 1$



Continuous on all intervals
 $(\frac{c}{2}, \frac{c}{2} + \frac{1}{2})$ where c is an integer

#64 $N = 25 \left(2 \left\lceil \frac{t+2}{2} \right\rceil - t \right) \quad 0 \leq t \leq 12$



t	$\left\lceil \frac{t+2}{2} \right\rceil$	N
0	1	50
1	1	25
1.999	1	0.025
2	2	50
3	2	25
3.999	2	0.025
	⋮	
	⋮	
	⋮	

(a) non-removable discontinuities
 at $t = 2, 4, 6, 8, 10, 12, \dots$

(b) every 2 months

etc.
 —