

MATH 20
Supplementary Materials

ANSWERS

1. Geometry Review

1. $m\angle 1 = 54^\circ$, $m\angle 2 = 126^\circ$ 2. (a) $70^\circ, 160^\circ$ (b) $27^\circ, 117^\circ$ (c) none, 70°
3. (a) 13 (b) 24 4. $5\sqrt{3}$ 5. $2\sqrt{73}$ 6. (a) No (b) Yes (c) Yes
7. 9 feet 8. $15\sqrt{2} \approx 21.2$ feet 9. $4\sqrt{3} \approx 6.9$ inches 10. 3.354 m
11. (a) isosceles right (b) right (c) $30^\circ-60^\circ-90^\circ$ (d) none (e) isosceles
12. $x = 4.5$, $y = 6$ 13. (a) $\angle CDB$ (b) $\angle CBA$ 14. 12 15. (a) $3\sqrt{2}$ (b) 18
16. (a) $x = 10$, $y = 10\sqrt{3}$ (b) $y = 7$ (c) $x = 2\sqrt{3}$, $y = 6$ (d) $x = 10$, $y = 5\sqrt{3}$
17. (a) $18\sqrt{2}$ (b) $8\sqrt{3}$ 18. 2.12 m
19.

AB	BC	CD	AD	DB	AC
8	$4\sqrt{3}$	$2\sqrt{3}$	2	6	4
$\frac{4}{\sqrt{3}}$	2	1	$\frac{1}{\sqrt{3}}$	$\sqrt{3}$	$\frac{2}{\sqrt{3}}$
$\frac{40}{\sqrt{3}}$	20	10	$\frac{10}{\sqrt{3}}$	$10\sqrt{3}$	$\frac{20}{\sqrt{3}}$
20. $8 + 3\sqrt{2}$ m 21. $27 + 12\sqrt{3} + 3\sqrt{21}$
22. (a) Yes (b) Yes (c) No (d) Yes (e) No (f) Yes
23. (a) 23° (b) 67° (c) 10 (d) 24
24. (a) $x = 14$, $y = 18$ (b) $x = 8.4$ (c) $x = 2$, $y = 4$ (d) $x = 3\sqrt{3}$, $y = \frac{4}{\sqrt{3}}$
24. (e) $x = 2.6$, $y = 2.4$ (f) $x = 10\sqrt{5}$, $y = 20$ (g) $x = 4.5$ (h) $x = 6.87$, $y = 7.5$
25. (a) SAS (b) SAS (c) AA 26. 4.5 27. 5 28. 16 29. 10

30. $3\frac{3}{4}$ feet

31. 38.4 feet

32. (a) 60° (b) 28° (c) 80°

33. (a) It doubles (b) It's four times as big

34. (a) Angles do not add up to 180° (b) Ratios are wrong (c) The sum of two sides of the triangle is not larger than the length of the third side (d) Sides should be 3,4,5 (e) Equal angles should have equal sides (f) Equal sides should have equal angles (g) Hypotenuse should be the longest side (h) Angle given in second triangle should be 110° (i) Equal sides should have equal angles

35. $6\frac{1}{4}$ cm

2. Trigonometry Review #1

1. $5\sqrt{2}$

2. sec A or csc C

3. $\frac{2}{\sqrt{3}}$

4. $\frac{\sqrt{34}}{5}$

5. $\sin \frac{5\pi}{14}$

6. 19°

7. $\frac{17}{8}$

8. $\frac{\pi}{6}$

9. $\frac{2}{3\sqrt{5}}$

10. 72°

11. $\frac{\sqrt{119}}{5}$

12. 60°

13. (a) 55.0° (b) 89.0°

14. (a) 1.06 (b) .51

15. (a) $\frac{1}{\sqrt{10}}$ (b) $\frac{3}{\sqrt{10}}$

16. csc 73°

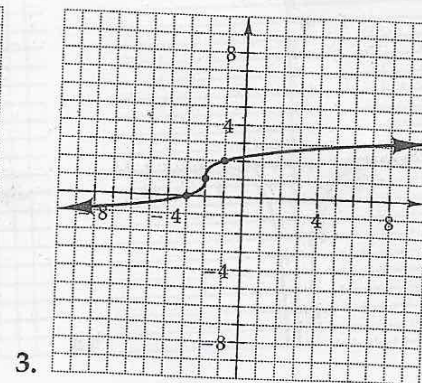
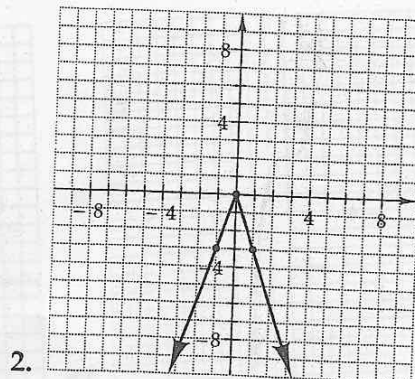
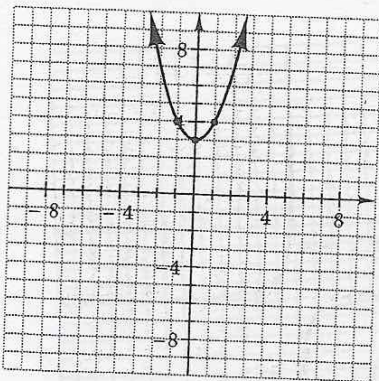
17. $\frac{5}{3}$

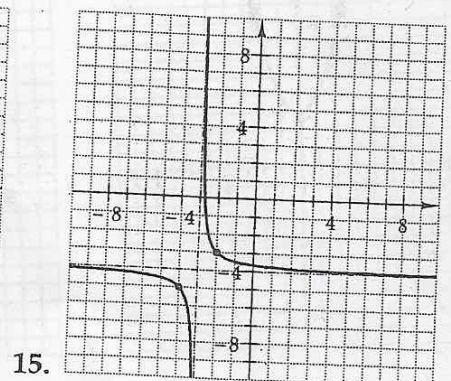
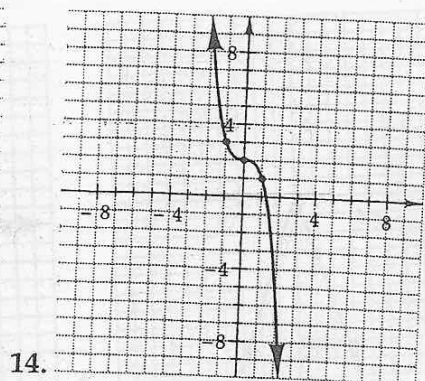
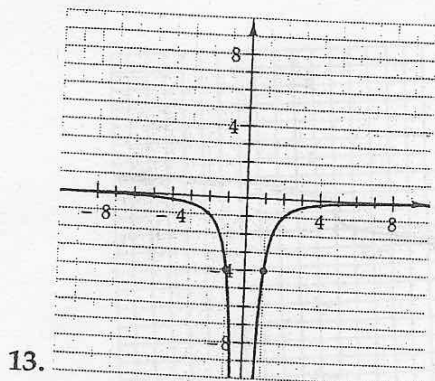
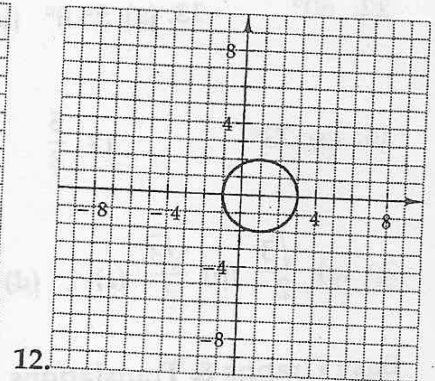
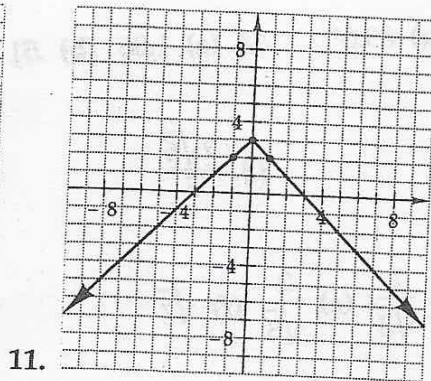
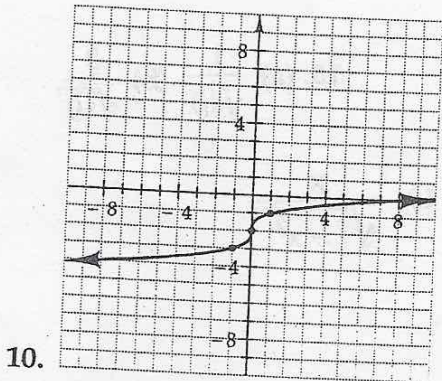
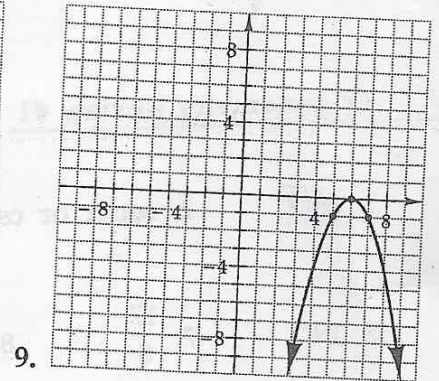
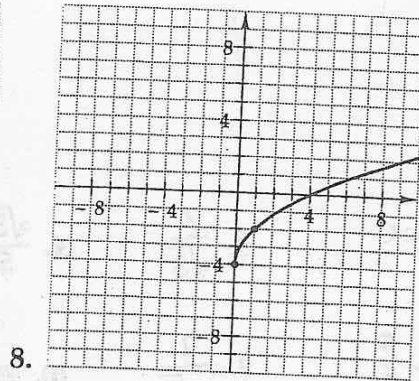
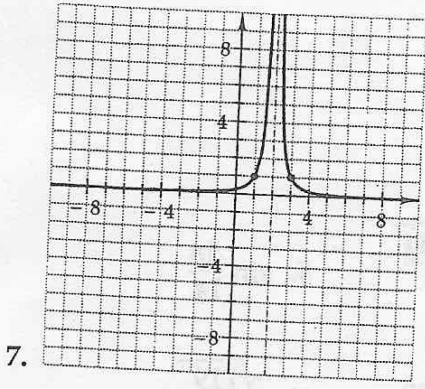
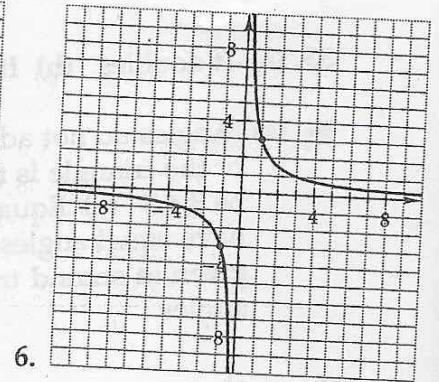
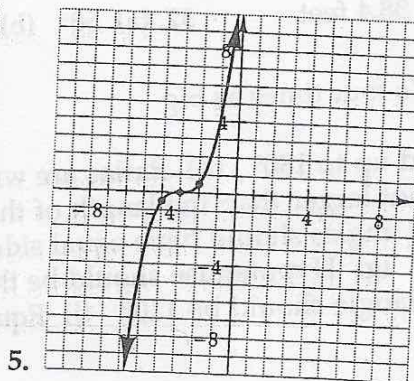
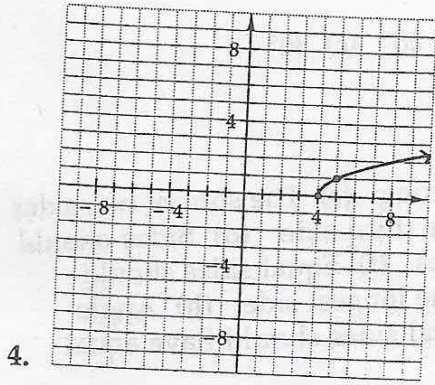
18. $\frac{2\sqrt{6}}{5}$

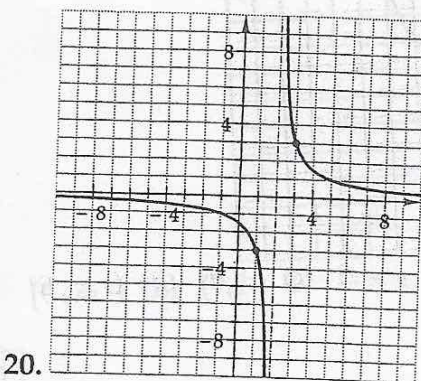
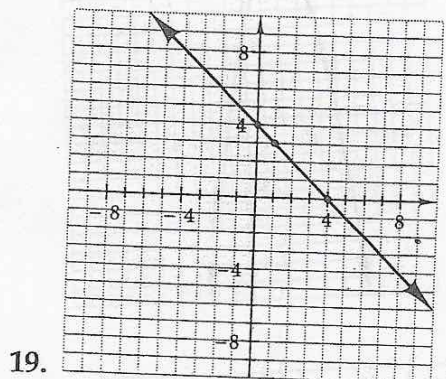
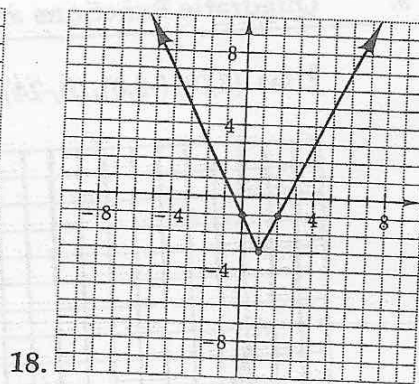
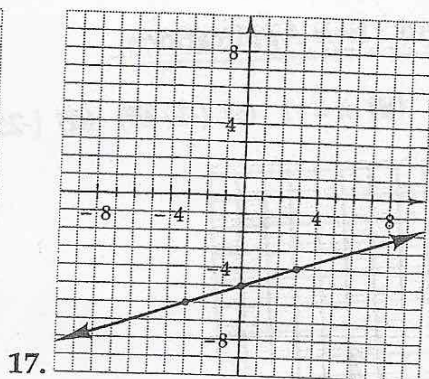
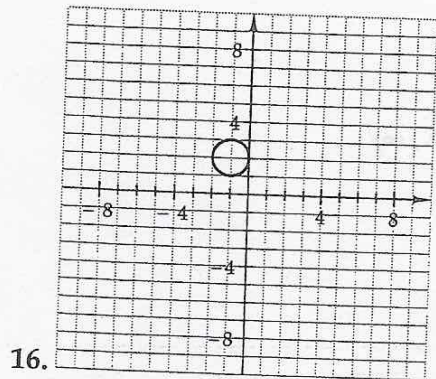
19. $\frac{x}{\sqrt{1-x^2}}$

20. (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\frac{1}{\sqrt{3}}$ (e) $\frac{2}{\sqrt{3}}$ (f) $\sqrt{2}$

3. Base Graphs & Translations





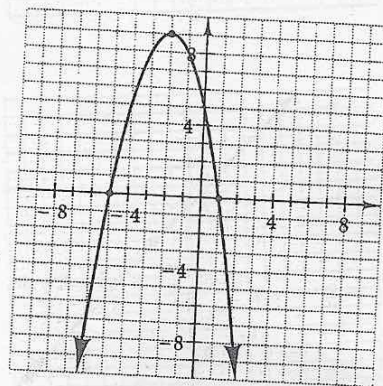
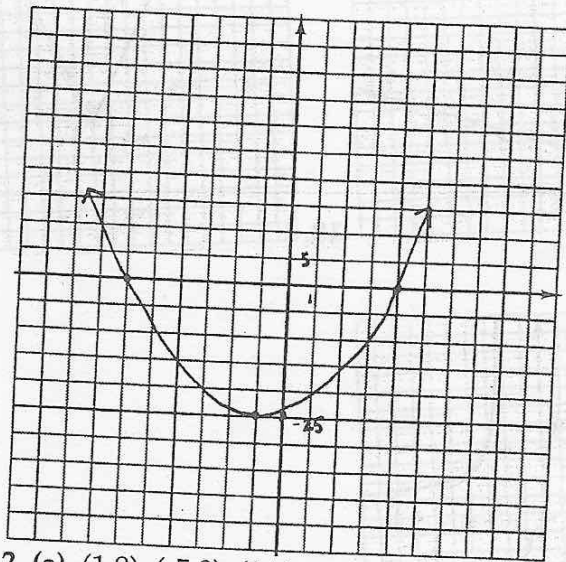


4. Functions

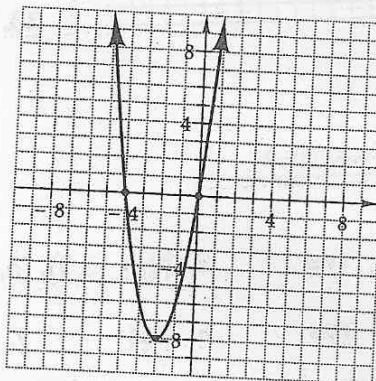
1. Yes 2. No: (2,2), (2,-2) 3. Yes 4. No: (1,1), (1,-1)
5. Yes 6. Yes 7. Yes 8. Yes 9. No: (2,3), (2,5)
10. Yes 11. Yes 12. Yes 13. Yes 14. Yes 15. Yes
16. 1. $(-\infty, \infty); [0, \infty)$ 3. $(-\infty, \infty); [0, \infty)$ 5. $(-\infty, \infty); (-\infty, \infty)$ 7. $(-\infty, \infty); (-\infty, \infty)$
9. $\{2\}, (-\infty, \infty)$ 10. $(-\infty, \infty); \{-3\}$ 13. $[-3, \infty); (-\infty, 0]$
14. $(-\infty, -2) \cup (-2, \infty); (0, \infty)$ 15. $(-\infty, 0) \cup (0, \infty); (-\infty, 2) \cup (2, \infty)$
17. (a) $(-\infty, -1]; (-\infty, \infty)$ (b) $[0, \infty); (-\infty, \infty)$ (c) $[0, 3]; [-3, 3]$
- (d) $(-\infty, \infty); [0, 3)$ (e) $(-\infty, -2) \cup (-2, \infty); (-\infty, 3)$ (f) $(0, \infty); (-\infty, -2) \cup (-2, \infty)$

5. Quadratic Functions and Their Applications

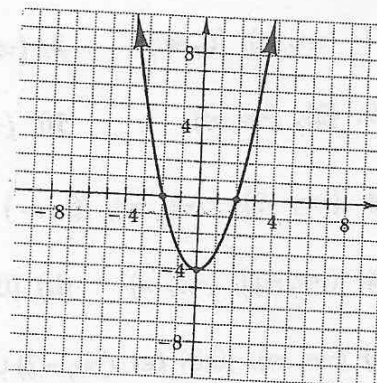
1. (a) $(4,0), (-6,0), (0,-24)$ (b) $x = -1$ (c) $(-1,-25)$ (d) $[-25, \infty)$



2. (a) $(1,0), (-5,0), (0,5)$ (b) $x = -2$ (c) $(-2,9)$ (d) $(-\infty, 9]$

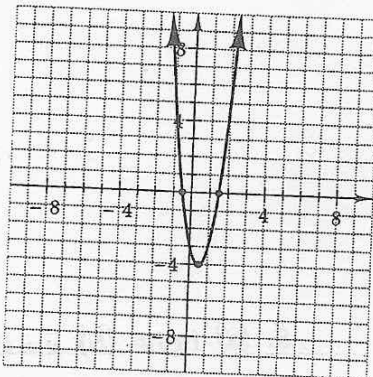


3. (a) $(0,0), (-4,0), (0,0)$ (b) $x = -2$ (c) $(-2,-8)$ (d) $[-8, \infty)$

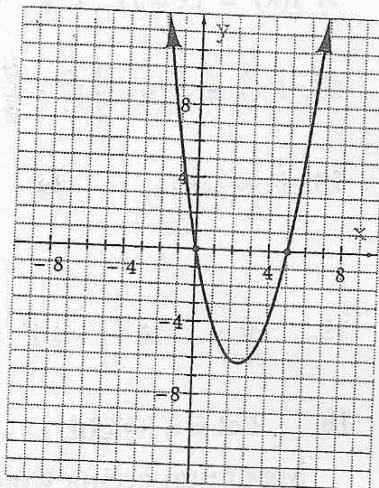


4. (a) $(2,0), (-2,0), (0,-4)$ (b) $x = 0$ (c) $(0,-4)$ (d) $[-4, \infty)$

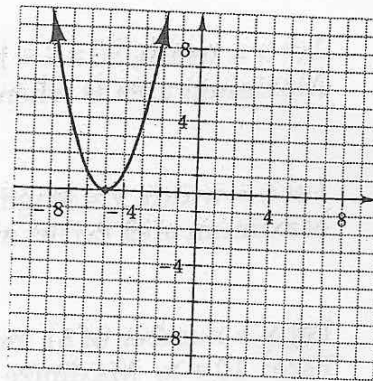
5. (a) $(-\frac{1}{2}, 0), (\frac{3}{2}, 0), (0, -3)$ (b) $x = \frac{1}{2}$ (c) $(\frac{1}{2}, -4)$ (d) $[-4, \infty)$

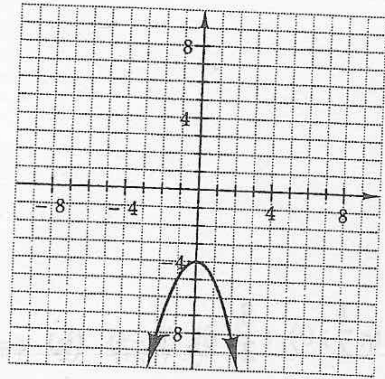


6. (a) $(0, 0), (5, 0)$ (b) $x = \frac{5}{2}$ (c) $(\frac{5}{2}, -\frac{25}{4})$ (d) $[-\frac{25}{4}, \infty)$



7. (a) $(-5, 0), (0, 25)$ (b) $x = -5$ (c) $(-5, 0)$ (d) $[0, \infty)$





8. (a) none (b) $x = 0$ (c) $(0, -4)$ (d) $(-\infty, -4]$
9. $f(x) = (x - 1)^2 + 2$ vertex: $(1, 2)$ 10. $f(x) = (x + 3)^2 - 10$ vertex: $(-3, -10)$
11. $f(x) = -(x - \frac{1}{2})^2 + \frac{9}{4}$ vertex: $(\frac{1}{2}, \frac{9}{4})$ 12. $f(x) = 2(x + 1)^2 - 7$ vertex: $(-1, -7)$
13. $(-\infty, \infty)$ 14. One number: x , Other number: $20 - x$
 Maximize product $P = x(20 - x)$
 Maximum occurs when $x = 10$ so the numbers are 10 and 10
15. $y = -16(t - 4)^2 + 400$ vertex: $(4, 400)$ Maximum height: 400 feet
16. Let $x =$ height, $12 - x =$ base Maximize Area $A = \frac{1}{2}x(12 - x)$
 Maximum occurs when $x = 6$ so the height is 6 inches and the altitude is 6 inches
17. Let $x =$ width, $50 - x =$ length Maximize Area $A = x(50 - x)$
 Maximum area is when $x = 25$ so the maximum area is 625 sq. in.
18. Let $x =$ width, $y =$ length Maximize Area $A = xy = x(300 - 3x)$
 Maximum area occurs at $x = 50$ so the width is 50 yds. and the length is 150 yds
19. Let $x =$ number of \$1 increases in fare Number of people: $200 - 10x$,
 Fare: $10 + x$, Maximize revenue $R = (200 - 10x)(10 + x)$
 Maximum revenue occurs at $x = 5$ so the most profitable fare is \$15.
20. Let $x =$ number of members above 150 Number of people: $150 + x$
 Charge per member: $20 - .80x$ Maximize revenue $R = (150 + x)(20 - .80x)$
 Maximum revenue occurs at $x = -62.5$ so the maximum revenue is \$6,125. (To get this revenue, the cost is \$70 per person and it is questionable that many people would spend \$70 for one dinner.)

6. FACTORIZING

1. $(x-2)(2x+3)(2x-3)$
2. $2(2x+5)(x+7)$
3. $(5x-4y)^2$
4. $(4\cos x - 1)(\cos x - 3)$
5. $(x-y+2)(x-y-2)$
6. $(\tan x - 1)(\tan x + 2)$
7. $(\sin x + \cos x + 3)(\sin x + \cos x - 3)$
8. $(\tan x + 1)(\tan^2 x - \tan x + 1)$
9. $(2x-5)(4x^2 + 10x + 25)$
10. $(x-y+3)(x^2 - 2xy + y^2 - 3x + 3y + 9)$
11. $(x^{1/3} + 3)(x^{1/3} - 8)$
12. $(x^{1/2} - 2)(x^{1/2} - 3)$
13. $[(x+3)^{-1} - 5][(x+3)^{-1} + 2]$
14. $(x-a)(x+a+1)$
15. $3(x+2)^{-2}(x-1)^{-3}$
16. $2x^{-3/2}(1+2x)(1-2x)$
17. $(y+2)^{-4/5}(y+1)$
18. $x^{-1/2}(x-3)^{-3/2}(x^2 - 3x + 1)$
19. $x^n(x+3)$
20. $(x^n + 3)^2$
21. $(y^{2n} + 9)(y^{2n} - 9)$
22. $x^2(x^n + 6)(x^n - 5)$
23. $x^n(6x^2 - 3x - 1)$

7. RATIONAL EXPRESSIONS

1. $\frac{-1}{x+1}$
2. $\frac{-1}{\tan x + 3}$
3. $4x^2 + 2x + 1$
4. $\frac{8 + \cos x}{-2}$
5. $x + a$
6. $x + h + 5$
7. $\frac{\sin^2 x + 3\sin x + 9}{\sin^2 x + 3}$
8. $\frac{-2}{h}$
9. $\frac{1-x}{(x+1)^2}$
10. -1
11. $\frac{(y-1)(y-2)}{(y+2)(y+1)}$
12. $\frac{1}{\sin x}$
13. $\frac{2}{a^2(a+x)}$
14. $\frac{\sin x \tan x}{6(\sin x - 2)}$
15. 1
16. $\frac{1}{3}$
17. $-\frac{3}{8}$
18. $\frac{n+1}{3n}$
19. $\frac{4n(n+2)}{(n+1)^2}$
20. $\frac{9}{n}$
21. $\frac{2x+47}{10x}$

22. $\frac{-3x+7}{3x-4}$ 23. $\frac{4a-3}{3a-1}$ 24. $\frac{-2}{a^2-1}$
25. $\frac{2}{a^{2x}+1}$ 26. 1 27. $\frac{x+2}{x^{n+1}}$
28. $\frac{a+bx}{x^{n+1}}$ 29. $\frac{2x^2-1}{x^{n+1}}$ 30. $\frac{1}{2}$
31. $\frac{1}{1-\tan x}$ 32. $\frac{\tan x-6}{2\tan x-3}$ 33. $\frac{10-3\tan x}{4\tan^2 x}$
34. $\frac{1-\tan^2 x}{\tan x}$ 35. $\frac{3\cos^2 x+4}{10\cos x}$ 36. $\frac{2}{\tan^2 x-4}$
37. $\frac{\cos x+2}{\cos x+1}$ 38. $\frac{-1}{2(\cos x+3)}$ 39. $\frac{-1}{x(x+h)}$
40. $\frac{-4x-2h}{x^2(x+h)^2}$

8. COMPLEX FRACTIONS and EXPONENTS

1. $\frac{z+5}{z+2}$ 2. $\frac{x^2+3x-4}{4}$ 3. $\sin \theta$
4. $\frac{-3(2x+h)}{x^2(x+h)^2}$ 5. $1-2x^2$ 6. $\frac{1}{\cos x + \sin x}$
7. $\frac{n^2+2n+1}{-n^2}$ 8. $\frac{2n-2}{3n}$ 9. $\frac{x^2+y^2}{y^2-x^2}$
10. $\frac{xy}{y+x}$ 11. $\frac{1}{x^{3/4}}$ 12. $(y+3)^{3/2}$
13. $x^{3/4} z^{3/4}$ 14. $\frac{x^2-2x+1}{x}$ or $\frac{(x-1)^2}{x}$ or $x-2+\frac{1}{x}$
15. $\frac{x+1}{x-1}$ 16. a^{x+1}

9. DIFFERENCE QUOTIENT

1. -5

2. $\frac{1}{2}$

3. $10x + 5h$

4. $1 + 2x + h$

5. $-4x - 2h$

6. $6x + 3h - 6$

7. $\frac{-1}{x(x+h)}$

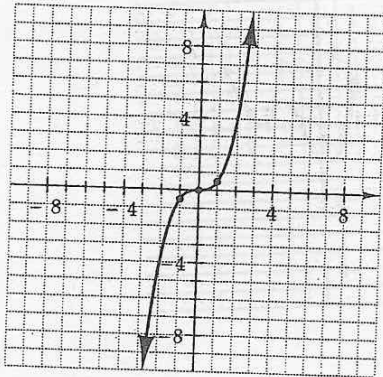
8. $\frac{-2}{(x+h+3)(x+3)}$

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

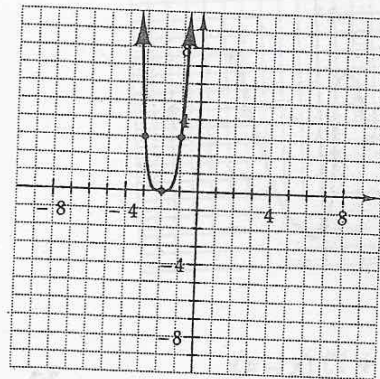
10. 0

10. Polynomial Graphs

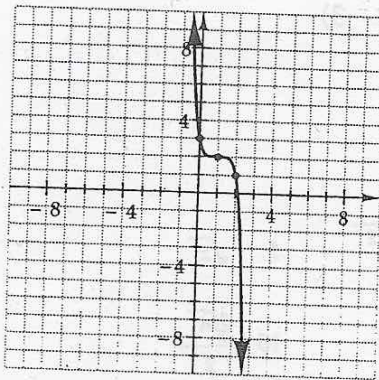
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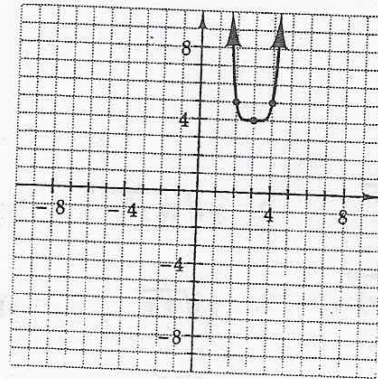
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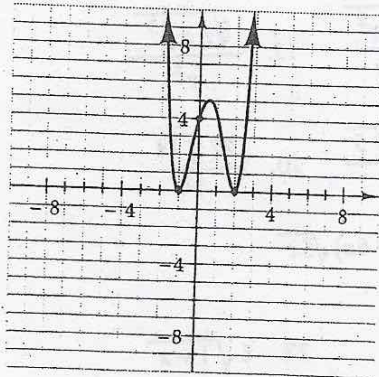
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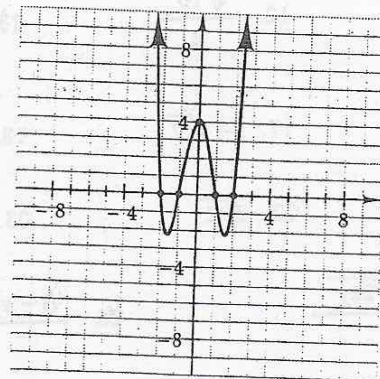
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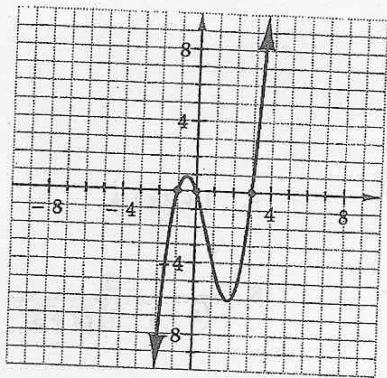
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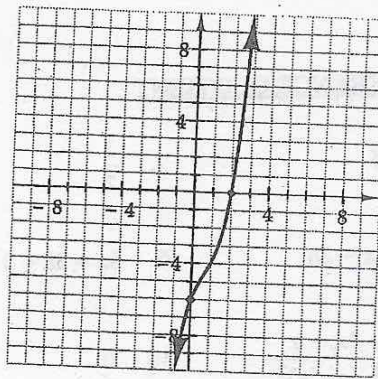
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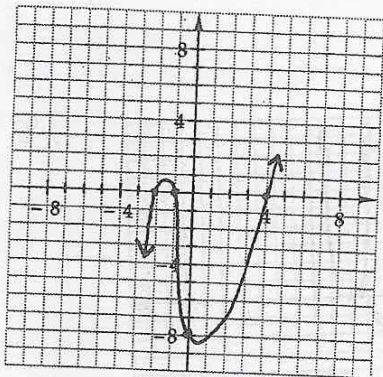
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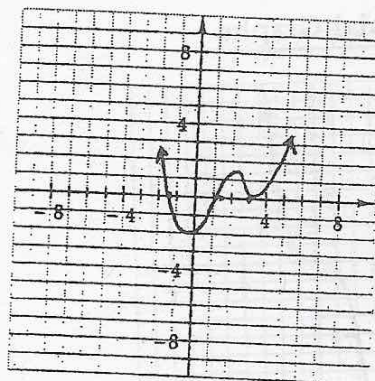
8.



9. $y = (x+1)(x^2-2x-8) = (x+1)(x-4)(x+2)$



10. $y = (x-3)^2(x+\sqrt{2})(x-\sqrt{2})$



11. $y = x^2(x+7)(x-4)$

12. $y = -x^2(x+3)(x-3)$

12. RADICALS

1. $xy\sqrt[4]{9x^2y^3}$

2. $y\sqrt[5]{16x^3}$

3. $\sqrt{3}$

4. $\sqrt[3]{y^2}$

5. \sqrt{x}

6. $\sqrt[3]{y^2(x+y)}$

7. $y\sqrt[3]{9y}$

8. $x^2\sqrt{2x}$

9. $\frac{\sqrt{2}}{2}$

10. $\frac{\sqrt[3]{4}}{2}$

11. $-\frac{\sqrt[3]{6}}{2}$

12. $\frac{\sqrt[4]{10}}{2}$

13. $\frac{3\sqrt{x}}{x}$

14. $\frac{\sqrt[3]{xy^2}}{y}$

15. $\frac{\sqrt[4]{2xy^3}}{y^2}$

16. $\frac{3\sqrt{5}}{10}$

17. $-7\sqrt{2}$

18. $-24\sqrt{7}$

19. $\frac{54\sqrt{5}}{5}$

20. $\frac{27\sqrt{14}}{14}$

21. $-10\sqrt[3]{2}$

22. $\sqrt[4]{2}$

23. $8\sqrt{2x}$

24. $(2y-6x)\sqrt{5x}$

25. $\frac{(12x-y)\sqrt[3]{2xy}}{2}$

26. $\frac{(1-y)\sqrt[4]{xy^3}}{y}$

27. $6\sqrt{1+x}$

28. $2\sqrt{3}$ 29. $\sqrt[3]{12}$ 30. 2 31. $3x\sqrt{10}$ 32. $-24x^2y\sqrt{6y}$
33. $2xy\sqrt[3]{3xy}$ 34. $60x^2$ 35. $40\sqrt{2}-30$ 36. 4 37. -68
38. $3+2\sqrt{2}$ 39. $9-4\sqrt{5}$ 40. $15-3\sqrt{6}-5\sqrt{2}+2\sqrt{3}$ 41. $36\sqrt{2}-51$
42. $x-2\sqrt{xy}+y$ 43. $x+y$ 44. $2\sqrt{2}$ 45. $\frac{\sqrt{30}}{3}$ 46. $\frac{\sqrt{6x}}{x}$
47. $\frac{2\sqrt{10}}{x}$ 48. $\frac{-\sqrt[3]{4}}{4}$ 49. $\frac{\sqrt[4]{56x}}{2}$ 50. $\frac{\sqrt[5]{5\cdot 3^4y^2}}{3}$
51. $\frac{-2\sqrt{3}}{9}$ 52. $\frac{\sqrt[3]{4}}{2}$ 53. $-3+3\sqrt{2}$ 54. $\frac{19+7\sqrt{7}}{-12}$
55. $\frac{x-\sqrt{xy}}{x-y}$ 56. $\sqrt{a^2+b^2}$ 57. $\frac{(R-2x)\sqrt{R^2-x^2}}{R-x}$
58. $\frac{-\sqrt{x^2+1}}{x^2(x^2+1)}$ 59. $\frac{-x+\sqrt{xy}}{2x^2}$ 60. 6 61. $\frac{17}{2}$

13. EQUATION REVIEW:

1. $(-\infty, 1) \cup (1, \infty)$ 2. $\frac{-1 \pm \sqrt{2}}{3}$ 3. $\frac{\sqrt{6}}{12}, -\frac{\sqrt{6}}{6}$ 4. -3, -2, 3, 4
5. $\frac{2 \pm \sqrt{13}}{9}$ 6. 5 7. -11 8. -7, -9 9. $\frac{3}{20}, \frac{4}{15}$
10. $\pm\sqrt{3}, \pm 3i$ 11. $0^\circ, 180^\circ, 120^\circ, 240^\circ$ 12. $45^\circ, 135^\circ, 225^\circ, 315^\circ$
13. $45^\circ, 225^\circ, 108^\circ, 288^\circ$ 14. $132^\circ, 228^\circ, 76^\circ, 284^\circ$ 15. $\frac{3\pi}{4}$
16. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ 17. all x in $[0, 2\pi)$ 18. 1.01, 2.13, 4.15, 5.27
19. All solutions: $\frac{\pi}{2} + 2n\pi, \frac{3\pi}{2} + 2n\pi, \frac{\pi}{4} + 2n\pi, \frac{3\pi}{4} + 2n\pi$ 20. All solutions: $\frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi$

14. ABSOLUTE VALUE INEQUALITIES:

1. $[-2, 8]$ 2. $(-\infty, -4] \cup [1, \infty)$ 3. $(2, \frac{5}{2})$ 4. $(-\infty, 1) \cup (\frac{7}{3}, \infty)$
5. $(-\infty, -5] \cup [\frac{5}{3}, \infty)$ 6. $[-7, 13]$ 7. {4} 8. $(-\infty, 4) \cup (4, \infty)$
9. \emptyset 10. $(-\infty, \infty)$ 11. $[-3, 7]$ 12. (1, 5)
13. $(-\infty, -5] \cup [\frac{13}{3}, \infty)$ 14. $(-\infty, \infty)$ 15. $[-6, 12]$
16. $(-\infty, -\frac{10}{3}) \cup (\frac{14}{3}, \infty)$ 17. $[-56, 40]$ 18. $(-\infty, -22] \cup [10, \infty)$
19. $(-\infty, 3] \cup [11, \infty)$ 20. $(-\infty, -2) \cup (\frac{8}{5}, \infty)$

15. POLYNOMIAL INEQUALITY HANDOUT

1. $(-\infty, 0] \cup [2, \infty)$
2. $[-5, 5]$
3. $x = -3$
4. $[0, \infty)$
5. $(-\infty, -6) \cup (4, \infty)$
6. No solution
7. $(-\infty, -1] \cup [5, \infty)$
8. $[1, 5]$
9. $(-2, 0) \cup (0, 2)$
10. $(-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$
11. $[-1, \frac{3}{2}]$
12. $(-\infty, -\sqrt{7}] \cup [\sqrt{7}, \infty)$
13. $[-2, -1] \cup [1, 2]$
14. $[-3, -1] \cup [0, 1] \cup [3, \infty)$
15. No solution
16. $(-\infty, -1) \cup (1, \frac{5}{2})$

16. RATIONAL INEQUALITY HANDOUT

1. $(-\infty, -1] \cup (0, \infty)$
2. $(-\infty, -1] \cup [1, \infty)$
3. $(-\infty, -1) \cup [0, \infty)$
4. $(-\infty, 1] \cup [3, +\infty)$
5. $(-\infty, 0) \cup (3, \infty)$
6. $(-\infty, -3] \cup (1, \infty)$
7. $(-\infty, -2) \cup [0, 4]$
8. $(-\infty, 0)$
9. $(-\infty, -2] \cup [2, 3)$
10. No solution
11. $(-\infty, 2) \cup [6, \infty)$
12. $(-2, 1]$
13. $(-21, 7)$
14. $(-\infty, -5)$
15. $(-3, 2)$
16. $[-1, 1) \cup [6, \infty)$
17. a) $(-\infty, -2] \cup [2, \infty)$
- b) $(-\infty, -1] \cup (2, \infty)$

17. SYSTEMS OF EQUATIONS HANDOUT

1. $(2, -1)$
2. no solutions - inconsistent
3. infinitely many - dependent
4. $(1.5, 1)$
5. $(-1, -1)$
6. no solutions - inconsistent
7. $(6, 0)$
8. $(5, 9)$
9. $(2, -3, -2)$
10. $(-4, 8, 5)$
11. no solutions - inconsistent
12. infinitely many - dependent
13. $(2, 5, 2.5)$
14. no solutions - inconsistent
15. $(1, 0, -2)$
16. infinitely many - dependent

18. GUASS-JORDAN METHOD HANDOUT

1. $(3, 0)$
2. $(1, 3)$
3. dependent - infinitely many solutions
4. Inconsistent - no solutions
5. $(7, -3, -5)$
6. $(\frac{4}{5}, -\frac{2}{5}, \frac{1}{5})$
7. $(\frac{1}{2}, -1, \frac{1}{2})$
8. $(-4, 2, 8)$
9. Inconsistent - no solution
10. Dependent - infinitely many solutions
11. $(1, 1, 1, 1)$

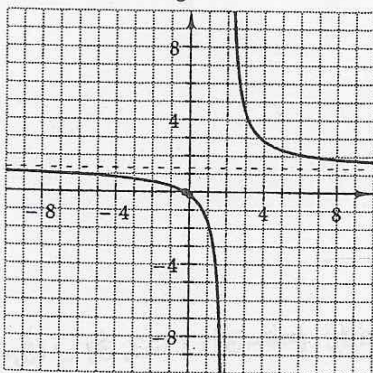
19. APPLICATIONS OF SYSTEMS OF EQUATIONS

1. 54 couples, 36 singles
2. 12 mph, 3 mph
3. 200 mi, 220 mi
4. 12 cm, 18 cm, 24 cm
5. 19, 10, 3
6. $y = 2x^2 + 3x - 4$
7. $y = -2x^2 + 5x - 1$
8. $x^2 + y^2 - 4x = 0$
9. $x^2 + y^2 - 6x - 8y = 0$
10. Kent 3 hr, Sharon 1 hr
11. 20 gals of X, 18 gls of Y, and 16 gals of Z
12. Infinitely many combinations, example: \$2000 at 6%, \$11000 at 10%, \$7000 at 8% or \$5000 at 6%, \$14000 at 10%, \$1000 at 8%
13. — — —

20. Rational Graphs Homework I

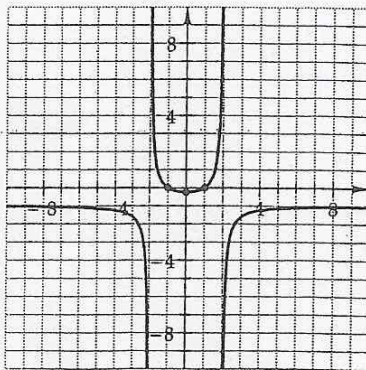
1. (a) $y = \frac{4x+1}{3x-6}$ Domain: $(-\infty, 2) \cup (2, \infty)$ VA: $x = 2$ HA: $y = \frac{4}{3}$

2. (a) $(-\frac{1}{4}, 0), (0, -\frac{1}{6})$ 3. (a) Behavior changes about vertical asymptote



4. (a) 1. (b) $y = \frac{x^2-1}{4-x^2}$ Domain: $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

VA: $x = -2, x = 2$ HA: $y = -1$ 2. (b) $(1,0), (-1,0), (0, -\frac{1}{4})$ 3. (b) Behavior changes about



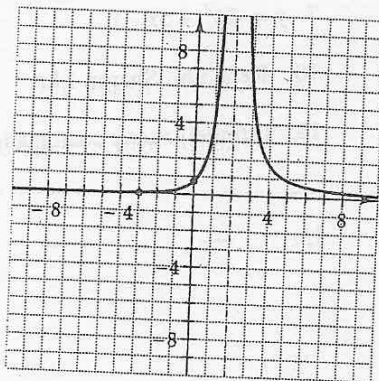
each vertical asymptote. 4. (b)

1. (c) $y = \frac{x+3}{(x-2)^2}$

Domain: $(-\infty, 2) \cup (2, \infty)$

VA: $x=2$ HA: $y=0$

2. (c) $(-3, 0), (0, \frac{3}{4})$



3. (c) Behavior remains same about vertical asymptote. 4. (c)

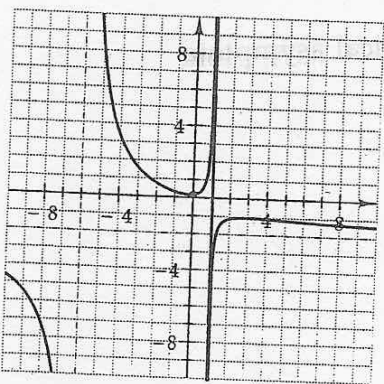
1. (d) $y = \frac{2x^2+1}{6-5x-x^2}$

Domain: $(-\infty, -6) \cup (-6, 1) \cup (1, \infty)$

VA: $x=-6, x=1$ HA: $y=-2$

2. (d) $(0, \frac{1}{6})$

3. (d) Behavior changes about each vertical asymptote

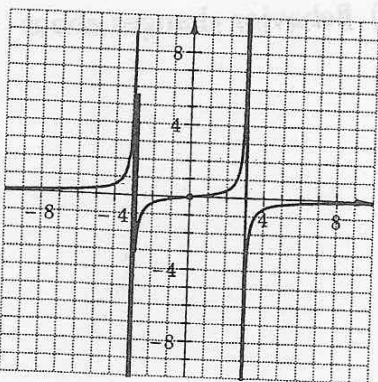


4. (d)

1. (e) $y = \frac{x}{9-x^2}$ Domain: $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

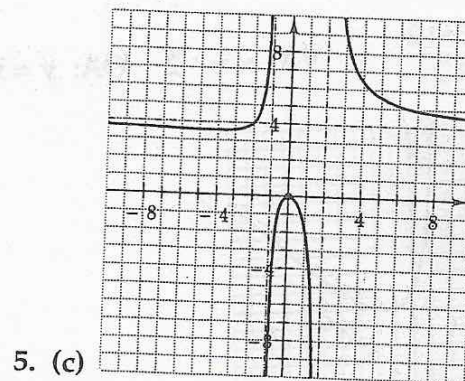
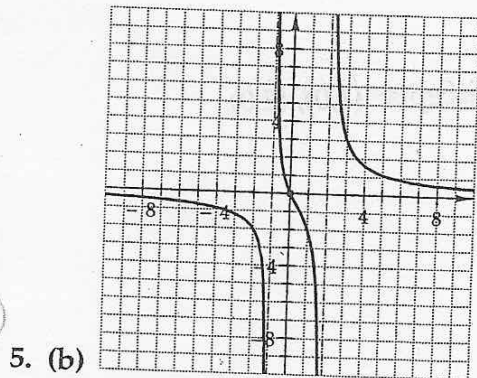
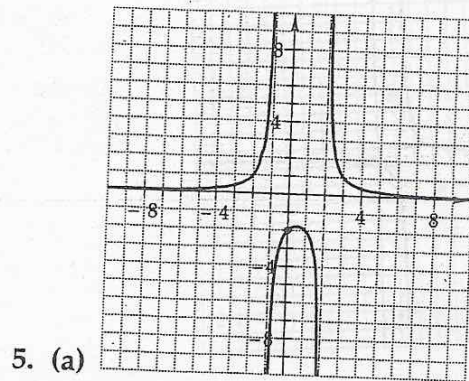
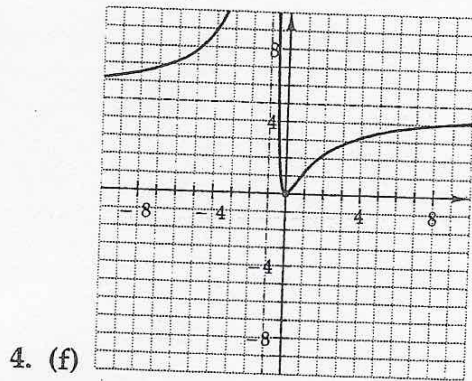
VA: $x=3, x=-3$ HA: $y=0$

2. (e) $(0, 0)$ 3. (e) Behavior changes about vertical asymptote



4. (e)

1. (f) $y = \frac{5x^2}{(x+1)^2}$ Domain: $(-\infty, -1) \cup (-1, \infty)$ VA: $x = -1$ HA: $y = 5$
 2. (f) $(0,0)$ 3. (f) Behavior remains same about vertical asymptote



20. Rational Graphs Handout II

1. (a) $y = \frac{x(x+1)}{(2x+3)(x+1)}$ Hole at $(-1, -1)$ (b) $y = \frac{(x+3)(x-4)}{x+3}$ Hole at $(-3, -7)$

(c) $y = \frac{x(x+1)}{(x+6)(x-1)}$ No holes (d) $y = \frac{3x^2}{x(2x+1)}$ Hole at $(0,0)$

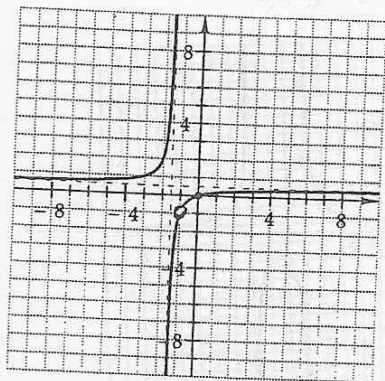
2. (a) Oblique Asympt: $y = \frac{x}{2}$ (b) Oblique Asympt: $y = x-5$ (c) Oblique Asympt: None
 x-intercepts: $(1,0), (-1,0)$ x-intercepts: $(2,0), (1,0)$ x-intercepts: $(3,0), (-3,0)$

3. (a) $y = \frac{x(x+1)}{(2x+3)(x+1)}$

VA: $x = -\frac{3}{2}$

HA: $y = \frac{1}{2}$

Hole at $(-1, -1)$

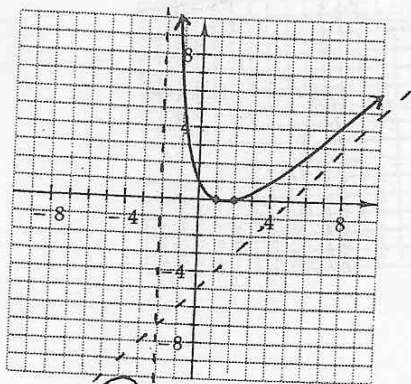


3. (b) $y = \frac{x^2 - 3x + 2}{x + 2}$

VA: $x = -2$

OA: $y = x - 5$

x-intercepts: $(1, 0), (2, 0)$

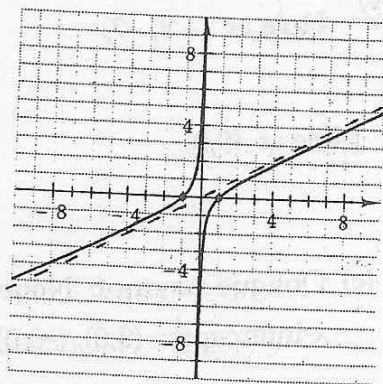


3. (c) $y = \frac{(x+1)(x-1)}{2x}$

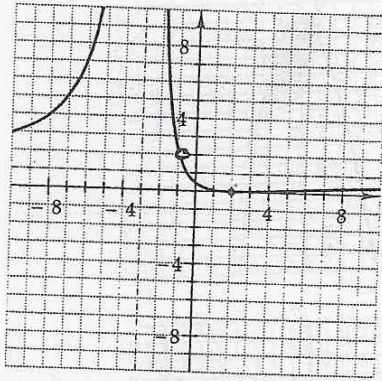
VA: $x = 0$

OA: $y = \frac{1}{2}x$

x-intercepts: $(-1, 0), (1, 0)$



3. (d) $y = \frac{(x-2)^2(x+1)}{(x+3)^2(x+1)}$ VA: $x = -3$ HA: $y = 1$ x-intercepts: $(2,0), (0, \frac{4}{9})$ Hole: $(-1, \frac{9}{4})$

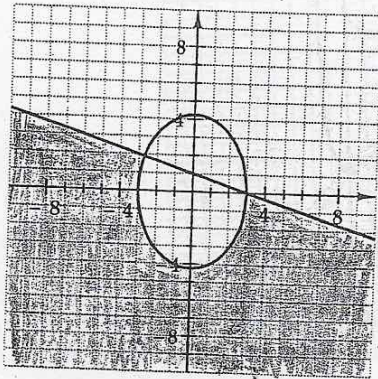


4. (a) $y = \frac{x}{x^2 - 4}$

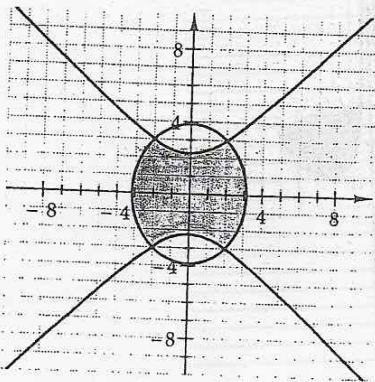
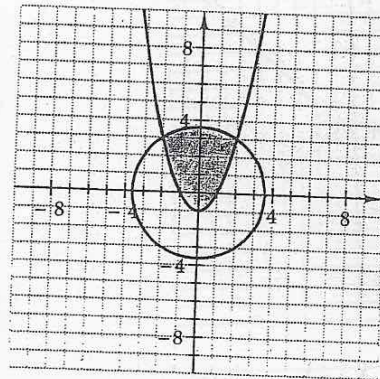
(b) $y = \frac{x^2}{(x-1)^2(x+1)^2}$

21. Non-Linear Systems of Inequalities

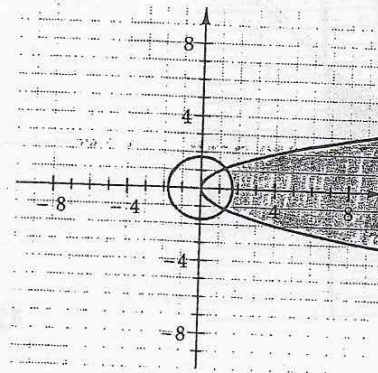
1.



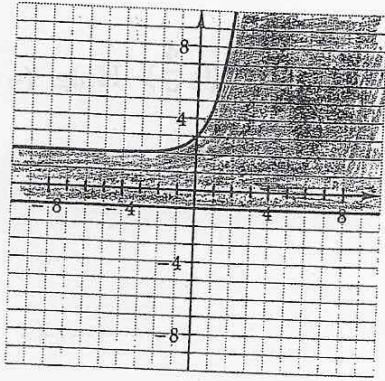
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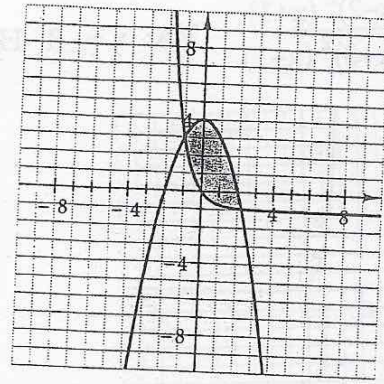
4.



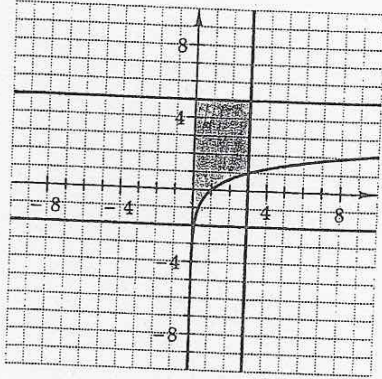
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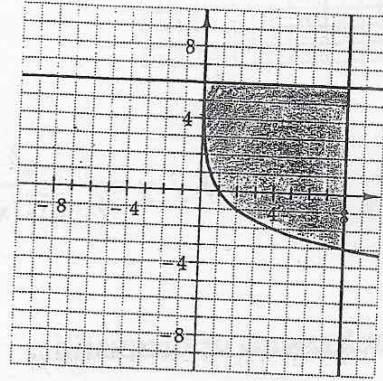
6.



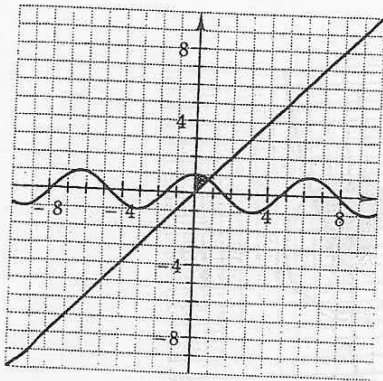
7.



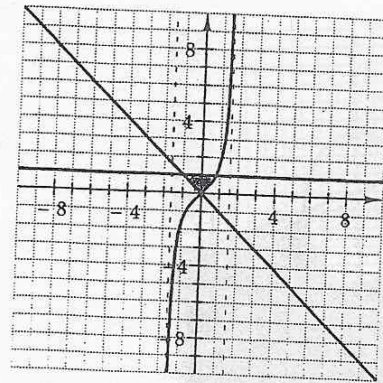
8.



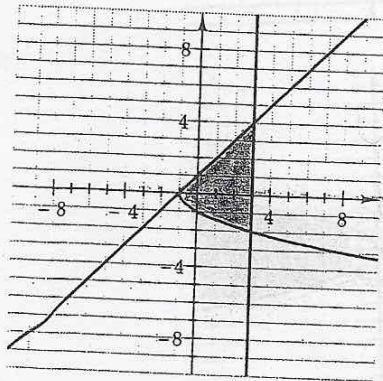
9.



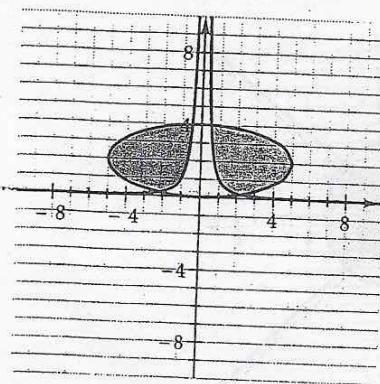
10.



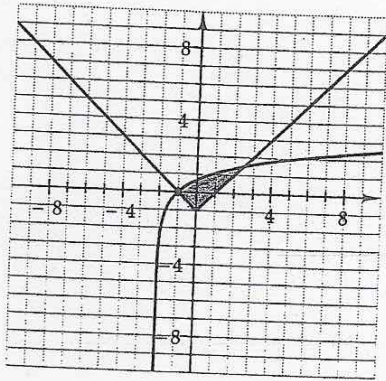
11.



12.



13.



14.

