Functions, Domain, and Range

Determine whether each is a function.

1) $\{(-3, 8), (4, -9), (2, 0), (-3, -1), (5, 11)\}$

2) $\{(7, -4), (-3, -4), (0, -4)\}$
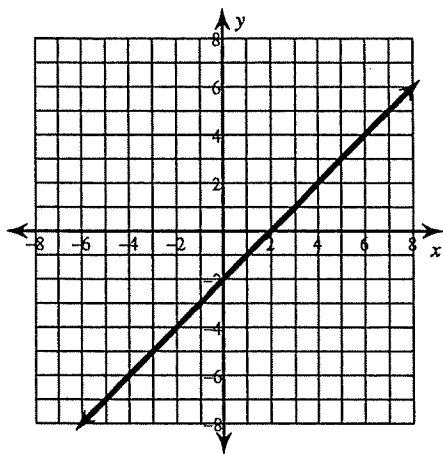
If $f(x) = -4x - 7$, find...

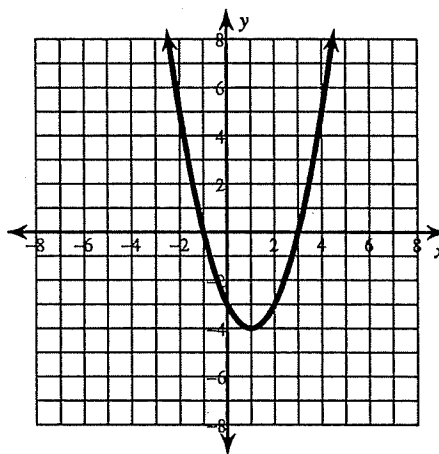3) a) $f(3)$ b) $f(-7)$

If $f(x) = -3x^2 - 2x + 1$, find...

4) a) $f(-4)$ b) $f(0)$

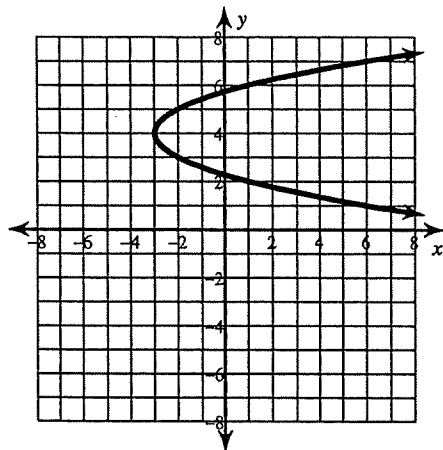**For each question, decide if it is a function. Then find the domain and range in set builder notation.**
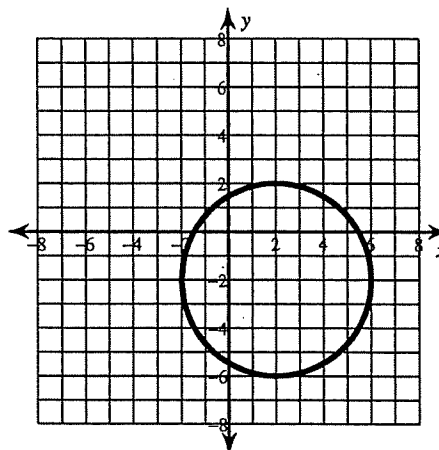
5)

6)

7)

8)

Given the function and a domain, find the range.

9) $f(x) = -7x + 3$, D={-12, -4, 3, 20}

10) $f(x) = 2x^2 - 2x + 5$, find $f(-4)$.

11) $f(x) = \dfrac{4x - 1}{3x + 2}$, find $f(3)$.

Answers

1) No

2) yes

3) a) -19
   b) 21

4) a) -39
   b) 1

5) yes; $D: \mathbb{R}$; $R: \mathbb{R}$

6) yes; $D: \mathbb{R}$; $R: y \geq -4$

7) no; $D: x \geq -3$; $R: \mathbb{R}$

8) no; $D: -2 \leq x \leq 6$; $R: -6 \leq y \leq 2$

9) $R = \{87, 31, -18, -137\}$

10) $f(-4) = 45$

11) $f(3) = 1$

MODELING WITH LINEAR FUNCTIONS

> **Complete the following problems on a separate sheet of paper. Show all work!!!!**

1. Pat was 20 inches long when he was born. By his 8th birthday he was 48 inches tall.

   a) Write a linear equation that describes his height (H) in inches in terms of his age (a).

   b) If he continued to grow at a similar rate, how tall will he be on his 15th birthday?

2. A nature preserve worker estimates there are 6000 deer in Sharon Woods Park. She also estimates that the population will increase by 75 deer each year thereafter.

   a) Write an equation that represents how many deer (D) will be in the park in x years.

   b) How many deer will be in the park in 7 years?

3. Alicia wants to rent a van. If she rents it for 3 days, it will cost $325. A 5-day rental will cost $475.

   a) Write a linear model for the rent, R in terms of the number of days, d.

   b) How many days can she have the van if she is willing to pay up to $850?

4. The population of Spring City was 5000 in 2000 and 7500 in 2010.

   a) Write a linear model for the population, P, in terms of the year, x.

   b) If this rate of growth continues, estimate the population in 2025.

5. A manufacturer pays its assembly line workers $11.00 per hour. In addition, workers receive a piecework rate of $0.75 per unit produced.

   a) Write a linear equation for the hourly wage (W) in terms of the number of units (x) produced per hour.

   b) If a workers wants to earn $20 per hour, how many pieces must she produce per hour?

6. The Acme Company has fixed costs of $16,000 per day for electricity and wages each day. The cost to produce its wall clocks is $5.35 per clock.

   a) Write a linear equation for the total cost C in terms of the number of clocks produced x per day.

   b) What will the company's costs be if it produces 10,000 clocks per day?

7. The free cash flow per share for Wal-Mart was $1.02 in 2007 and $4.98 in 2016.

   a) Write a linear equation that gives the free cash flow per share F in terms of the year x.

   b) If Wal-Mart maintains this growth rate, in what year will its cash flow per share be $8.00?

ANSWERS

1. a) $C(x) = 3.5x + 20$ b) 72.5 inches

2. a) $D(x) = 75x + 6000$ b) 6525 deer

3. a) $R(x) = 75x + 100$ b) 10 days

4. a) $C(x) = 250x - 495,000$ b) 11,250 people

5. a) $W(x) = 0.75x + 11.00$ b) 12 pieces per hour

6. a) $C(x) = 5.35x + 16,000$ b) $69,500

7. a) $F(x) = 0.44x - 882.06$ b) 2022

LINEAR REGRESSION HANDOUT

PROBLEM #1

NFL Career Passing Leaders (through 2012 Season)

Name	Tenure	Touchdowns	Yardage
Brett Favre	1991-2010	508	71,838
Warren Moon	1978-2000	435	70,553
Dan Marino	1983-1999	420	61,361
Peyton Manning	1998-present	436	59,487
Doug Flutie	1985-2005	369	58,179
Danny McManus	1988,1990-2006	259	53,255
John Elway	1983-1998	300	51,475
Henry Burris	1998-present	315	49,262
Fran Tarkenton	1961-1978	342	47,003
Vinny Testaverde	1987-2007	275	46,233
Drew Brees	2001-present	324	45,919
Jim Kelly	1984-1996	320	45,309
Tom Brady	2000-present	334	44,806
Drew Bledsoe	1993-2006	251	44,611
Jeff Garcia	1994-2011	281	43,300
Dan Fouts	1973-1987	254	43,040
Kerry Collins	1995-2011	208	40,922
Joe Montana	1979-1994	273	40,551
Johnny Unitas	1956-1973	290	40,239

1. Create a scatter plot which compares each player's passing yardage (Yds) to the number of touchdowns (tds). The yardage should be graphed on the *x*-axis and the touchdowns on the *y*-axis.

2. Find the equation of the linear regression line which best fits this data. Store it in f_1. Write the equation showing all decimal places as displayed in f_1.

3. What is the correlation coefficient of this data? How would you describe the correlation between this data?

4. Graph your linear regression line on the scatter plot.

5. Using the equation of your line, predict the number of touchdowns of a player who throws for 25,000 career yards. Round to the nearest whole number.

6. Using the equation of your line, predict the yardage thrown of a player with 600 touchdowns. Round to the nearest whole number.

PROBLEM #2

The table below contains information that compares years to the number of violent crimes.

Year	Violent Crime
1980	596.6
1985	556.6
1990	731.8
1995	684.6
2000	506.1
2005	490.5
2010	404.5
2012	386.9
2013	367.9

1. Create a scatter plot which compares the population of a city to the number of violent crimes per year. Year should be graphed on the x-axis and violent crime graphed on the y-axis. Scale the x-axis from 1975 to 2020 and the y-axis from 300 to 800.

2. Find the equation of the linear regression line which best fits this data. Write the equation showing all decimal places.

3. What is the correlation coefficient of this data? How would you describe the correlation between this data?

4. Graph your linear regression line on the scatter plot.

5. Using the equation of your line, predict the year in which the violent crime rate will drop to 200.

6. Using the equation of your line, predict the number of violent crimes in the year 2025. Round to the nearest tenth.

PROBLEM #3

Average Cost of Tuition,
Room, & Board at Public Universities

Year	Cost
1980	$2,550
1990	5,243
2000	8,653
2001	9,196
2002	9,787
2003	10,674
2004	11,426
2005	12,108
2006	12,797
2007	13,429
2008	14,262
2009	15,014
2010	15,918

1. Create a scatter plot which compares the year to the cost of tuition, books, room & board at a 4-year public institution. Years should be graphed on the x-axis and 4-year costs should be graphed on the y-axis.

2. Find the equation of the linear regression line which best fits this data.

3. What is the correlation coefficient of this data? How would you describe the correlation between this data?

4. Graph your linear regression line on the scatter plot.

5. Using the equation of your line, in what year will the cost of a 4-year institution reach $25,000?

6. Using the equation of your line, predict the cost of a 4-year public university in 2040 to the nearest dollar.

ANSWERS

PROBLEM #1

2. $y = 0.006988830495x - 26.1425238059$

3. $r = 0.87$. There is a strong correlation between the yardage passed and the number of touchdowns scored.

4.
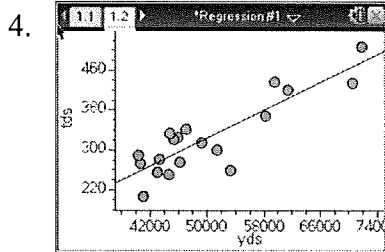
5. 149 touchdowns

6. 89,592 yards

PROBLEM #2

2. $y = -8.36820241692x + 17252.1623867$

3. $r = -0.78$ There is a good correlation between the year and the amount of violent crime.

4.
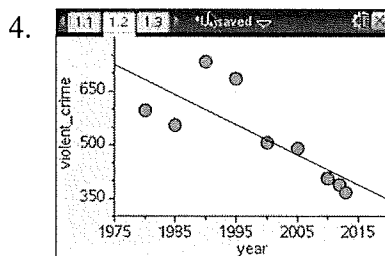
5. 2038

6. 306.6 violent crimes

PROBLEM #3

2. $y = 443.923161765x + -877849.4834$

3. $r = 0.97$ There is a very strong correlation between the year and the cost of a 4-year public university.

4.
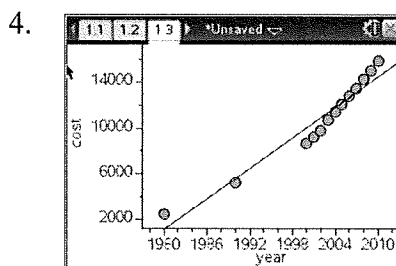
5. 2034

6. $27,754

ALGEBRA II HANDOUT
Graphs of Special Functions

Find the value of each greatest integer function. Show work to support your answer.

1. $f(x)=[2x+1]$ (a) $f(1.4)$ (b) $f(-4.3)$ (c) $f\left(-\dfrac{9}{7}\right)$

2. $h(x)=-3[x]+5$ (a) $h\left(\dfrac{2}{7}\right)$ (b) $h(-1.7)$ (c) $h\left(\dfrac{11}{3}\right)$

Graph each of the following functions.

3. $f(x)=|x+6|$

4. $f(x)=[x]+2$

5. $f(x)=-4$

6. $y>-\dfrac{5}{2}x+4$

7. $y\geq\dfrac{2}{3}|x+4|+3$

8. $3x-2y\leq 12$

9. $f(x)=-2[x-3]+1$

10. $y<-3|x-5|-2$

11. $5x+3y>15$

Write the equation of each of the following graphs.

12.

13.
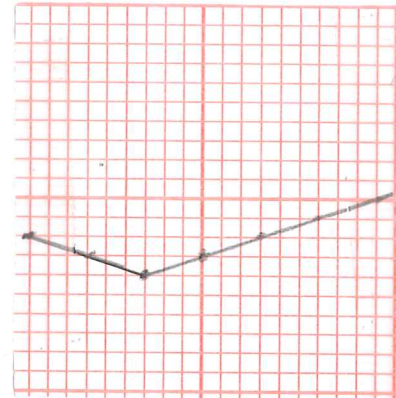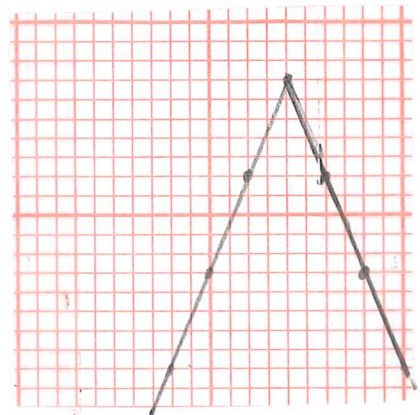
1. a) 3 b) −8 c) −2

2. a) 5 b) 11 c) −4
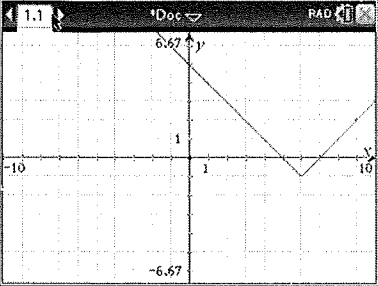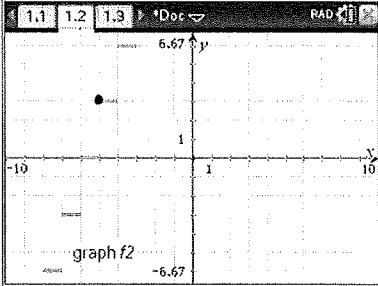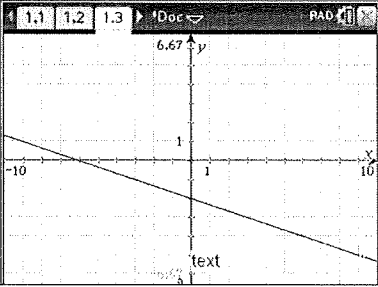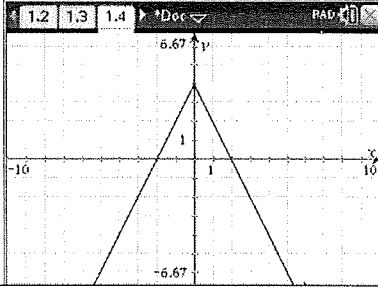
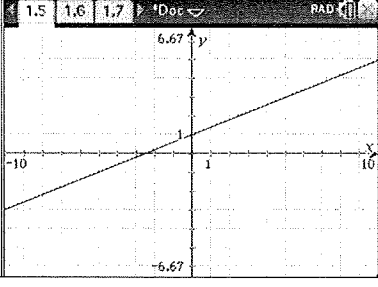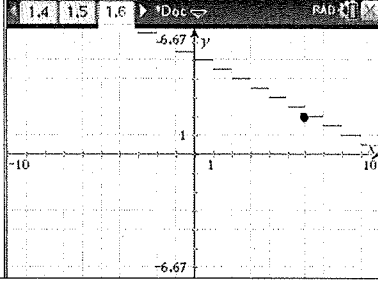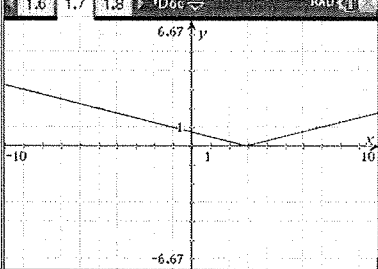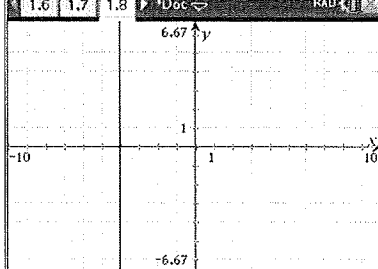12. $y = \frac{1}{3}|x+3| - 4$

13. $y = -\frac{5}{2}|x-4| + 7$

3.

4. Start

5.

6.

7.

8.

4	0
0	−6

9. Start

10.

11.

3	0
0	5
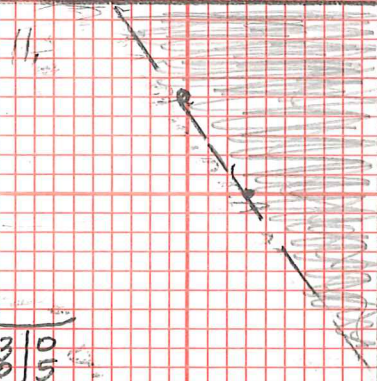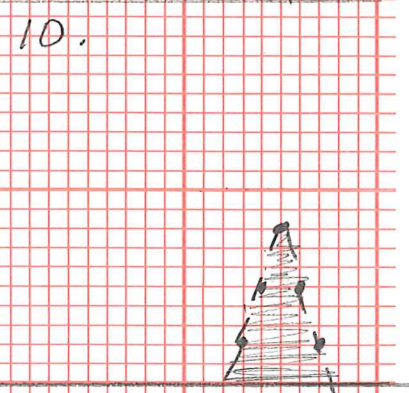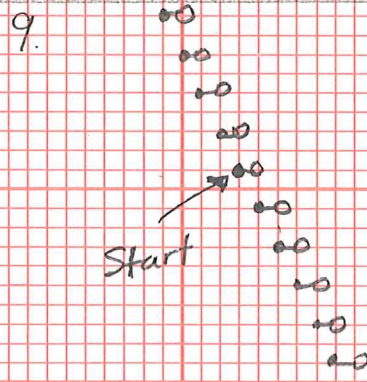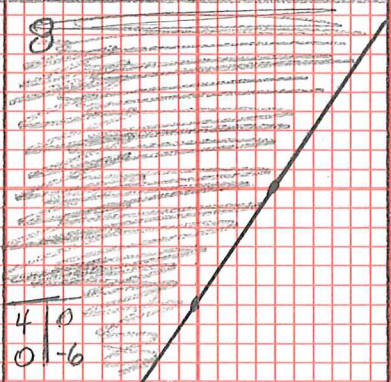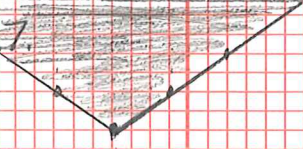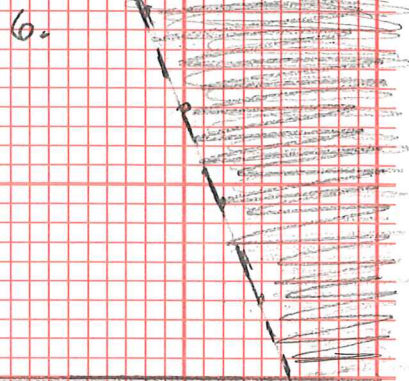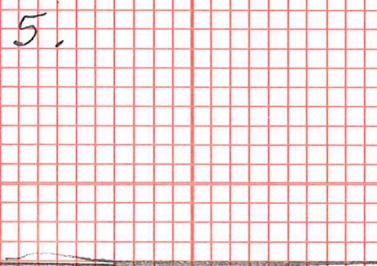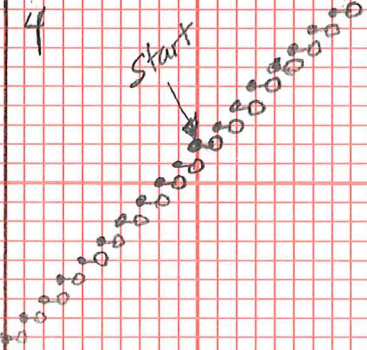
ALGEBRA 2 WORKSHEET

Name_____

Write the equation of each of the given graphs.

1.	2.
3.	4.
5.	6.
7.	8.

ANSWERS

1. $f(x) = |x - 6| - 1$

2. $f(x) = 3[x + 5] + 3$

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

4. $f(x) = -2|x| + 4$

5. $f(x) = \frac{2}{5}x + 1$

6. $f(x) = -\frac{1}{2}[x - 6] + 2$

7. $f(x) = \frac{1}{4}|x - 3|$

8. $x = -4$

Name_____

ALGEBRA II REVIEW
Linear Functions
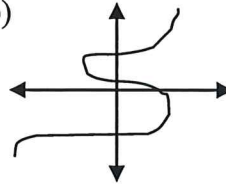
1. Determine whether each of the following is a function.
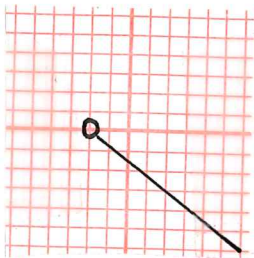
   (a) $\{(3,2),\ (4,-1),\ (0,5),\ (-3,-9),\ (7,-1)\}$

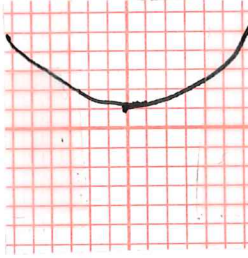   (b)

2. Give the domain and range of the following relations.

   (a)

   (b)

   (c)
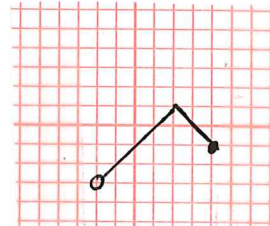
3. Find the slope of each of the following lines:

   (a) $y = -\dfrac{7}{3}x + 4$

   (b) $5x + 2y = 12$

   (c) $3y - 3x = 10$

   (d) $y = 7$

   (e) $(7,4)$ and $(-2,5)$

   (f) $(8,-3)$ and $(8,4)$

4. Determine whether the lines are parallel, perpendicular, or neither.

   (a) Line 1: through $(-2,7)$ and $(3,9)$
   Line 2: through $(4,-1)$ and $(-6,-5)$

   (b) Line 1: $y = -\dfrac{4}{7}x + 2$
   Line 2: $7x + 4y = 13$

   (c) Line 1: $3x - 8y = 17$
   Line 2: $11 - 3y = 8x$

5. Find the coordinates of the x- and y-intercepts of each of the following lines:

   (a) $5y + 3x - 10 = 0$

   (b) $4x + 12y = -15$

   (c) $x = -3$

   (d) $y = 8$

6. Graph the following lines:

   (a) $y = \dfrac{1}{2}x$

   (b) $y = -3x - 3$

   (c) $3x - 8y \leq 24$

   (d) $6x + 5y = 18$

7. Find the equation of the line satisfying the given conditions.
   Write your final answer in slope-intercept form.
   (a) parallel to the line $y = 4x - 9$, passes through $\left(\dfrac{2}{3}, \dfrac{2}{3}\right)$

   (b) passes through (-3,7) & (5,2)

   (c) passes through (3,-4) and (8,-4)

   (d) passes through (2,-4) and is perpendicular to the line $4x - 7y = 3$.

   (e) passes through $(5,-8)$ and is perpendicular to $y = -9$.

8. In 1997, a small college had an enrollment of 5000 students. By 2002, the enrollment had increased to 7000 students.
   (a) Write a linear equation for the college's enrollment E in terms of the year x.

   (b) If this growth continues, what will the enrollment be in 2010?

   (c) In what year will the enrollment reach 12,000 students?

9. A factory manufactures can openers at a cost of $2.75 per can opener. However, the fixed costs for the building, machinery, electricity, etc. are $26,000.
   (a) Write a linear equation for the cost C to produce x can openers.

   (b) How many can openers can be produced for $81,000?

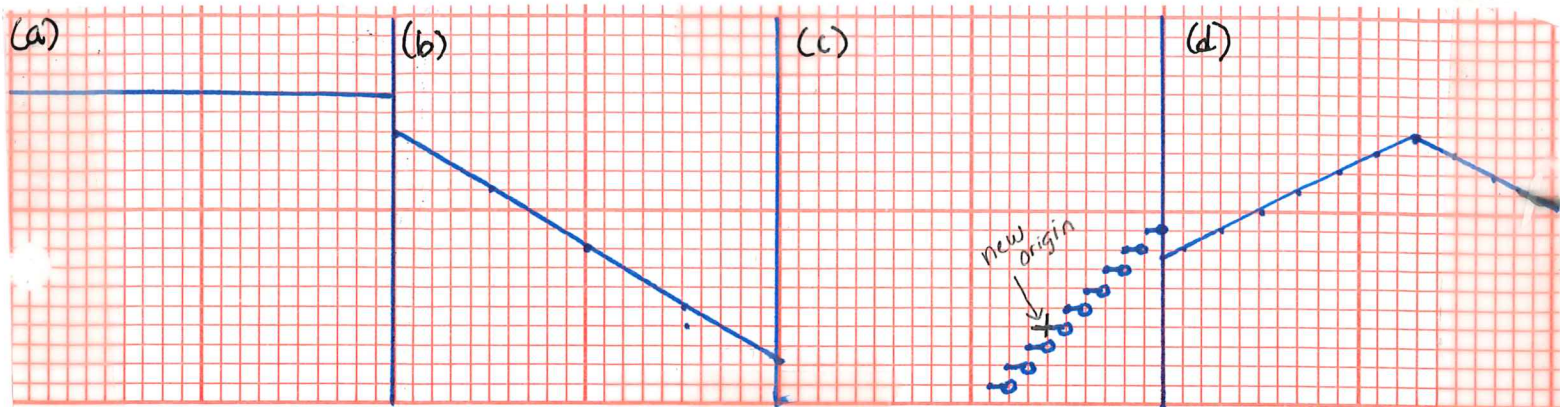10. Given $f(x) = 3\left[\dfrac{1}{2}x + 1\right]$, find: (a) $f(-2.8)$ (b) $f\left(\dfrac{10}{3}\right)$.

11. Given $f(x) = \begin{cases} 2|x+1| - 4 & \text{if } x < -4 \\ 9 & \text{if } -4 \le x \le 2, \\ 3x - 7 & \text{if } x > 2 \end{cases}$ find (a) $f\left(-\dfrac{1}{2}\right)$ (b) $f(8)$ (c) $f(-6)$.

12. Graph the following:
   (a) $f(x) = [x+4] - 2$ (b) $f(x) = -5$ (c) $y < 3x - 4$ (d) $y \ge -2|x-3| + 1$

13. Write the equation of the graph shown.

(a)

(b)

(c)

new origin

(d)

14. As the number of farms has decreased in the United States, the average size of the remaining farms has grown larger, as shown in the table below.

(a) Create a scatter plot of this data. Represent years on the x-axis and acres on the y-axis.

(b) Use linear regression to find the line of best fit for the data. Graph it on the scatter plot.

(c) Write the equation of the linear regression line.

(d) What is the correlation coefficient? How well does the line fit the data?

Year	Average Acreage Per Farm
1910	139
1920	149
1930	157
1940	175
1950	216
1959	303
1969	390
1978	449
1987	462
1997	487

(e) Predict the average number of acres per farm for the year 2020. Round to the nearest whole number. Solve using your calculator. *Do NOT solve by substituting numbers into the equation!*

(f) In what year would the average acreage per farm reach 700 acres? Round to the nearest whole number. Solve using your calculator. *Do NOT solve by substituting numbers into the equation!*

ANSWERS

1. (a) yes (b) no

2. (a) $x > -2$; $y < 0$ (b) $\Re$, $y \geq 1$ (c) $-2 < x \leq 4$; $-3 < y \leq 1$

3. (a) $-\dfrac{7}{3}$ (b) $-\dfrac{5}{2}$ (c) 1   (d) 0   (e) $-\dfrac{1}{9}$ (f) undefined

4. (a) parallel (b) neither (c) perpendicular

5. (a) x: $\left(\dfrac{10}{3}, 0\right)$ y: (0,2) (b) x: $\left(-\dfrac{15}{4}, 0\right)$ y: $\left(0, -\dfrac{5}{4}\right)$ (c) x: (-3,0) y: none (d) x: none y: (0,8)

6. see graphs

7. (a) $y = 4x - 2$ (b) $y = -\dfrac{5}{8}x + \dfrac{41}{8}$ (c) $y = -4$ (d) $\cancel{7x + 4y = 2}$ $y = -\dfrac{7}{4}x - \dfrac{1}{2}$ (e) $x = 5$

8. (a) $E(x) = 400x - 793{,}800$ (b) 10,200 students   (c) 2014

9. (a) $C(x) = 2.75x + 26{,}000$ (b) 20,000 can openers
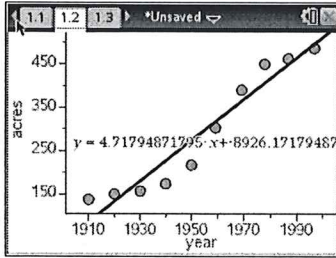
10. (a) –3 (b) 6

11. (a) 9   (b) 17   (c) 6

12. see graphs

13. (a) $f(x) = 6$ (b) $f(x) = -\dfrac{3}{5}x - 2$ (c) $f(x) = [x - 4] - 6$ (d) $f(x) = -\dfrac{1}{2}|x - 3| + 4$

14. (a/b)

(c) $y = 4.7179487179487x + 8926.1717948718$
(d) r = .96, strong correlation   (e) 604 acres   (f) 2040