3.3 Piecewise Functions
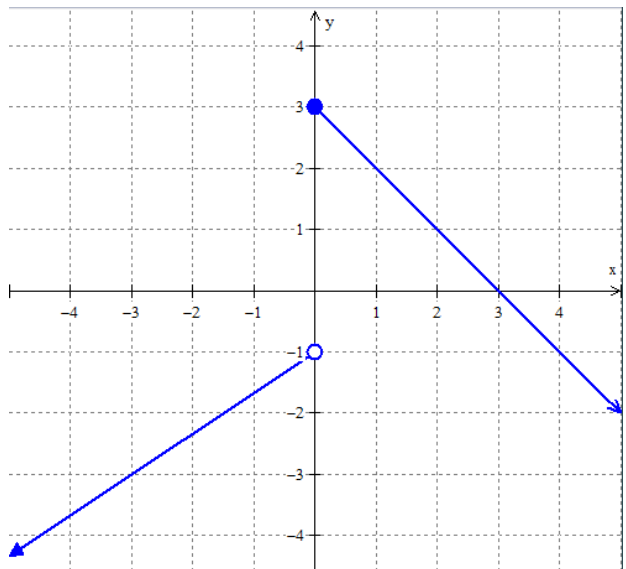
Piecewise Functions –

Algebraically

$$f(x) = \begin{cases} 2x + 8, & x \leq -2 \\ x^2 - 3, & -2 < x \leq 3 \\ \sqrt{x + 3}, & x > 3 \end{cases}$$

$f(-4) =$

$f(6) =$

$f(-2) =$

$f(0) =$

TRY IT!

$$f(x) = \begin{cases} 2x^3 - 1, & x < 1 \\ 3, & 1 \leq x < 5 \\ |x - 2|, & x \geq 5 \end{cases}$$
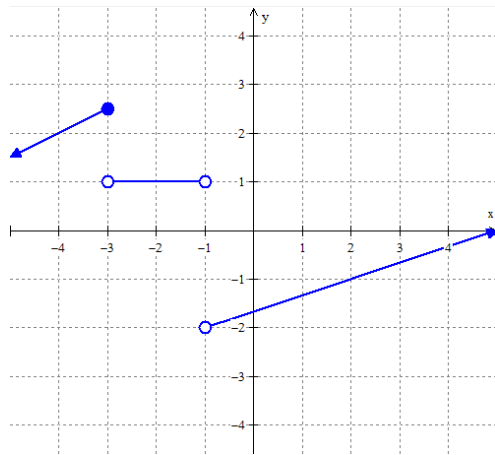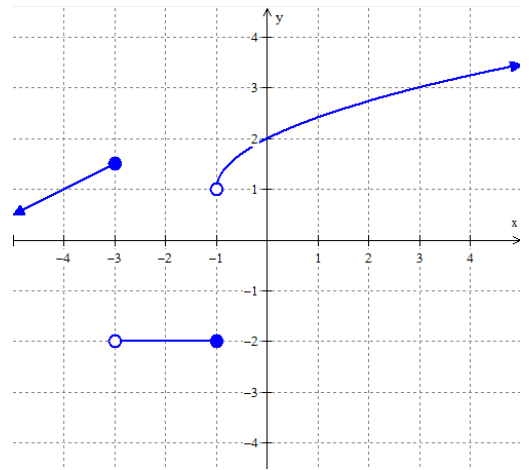
$f(8) =$

$f(0) =$

$f(4) =$

$f(5) =$

Graphically
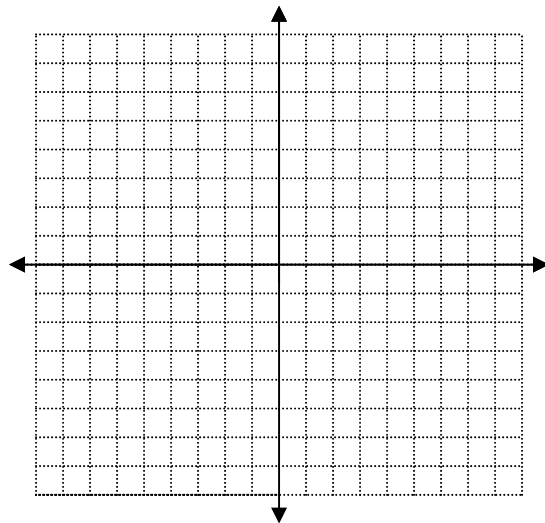

$f(2) =$

$f(-3) =$
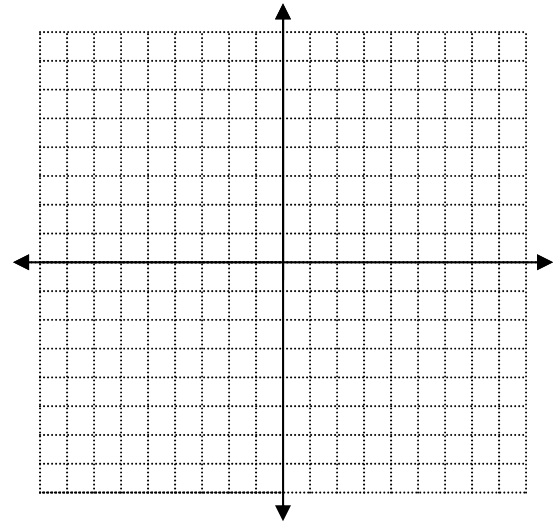
$f(-1) =$

$f(-4) =$

$f(0) =$

$f(-4) =$

$f(-1) =$

$f(3) =$

TRY IT!

$f(x) = \begin{cases} -2x + 1, & x < 0 \\ \frac{2}{3}x - 3, & x \geq 0 \end{cases}$

$f(x) = \begin{cases} 5, & x \leq 2 \\ 2x - 4, & x > 2 \end{cases}$

<u>SUMMARY:</u>

Now, summarize your notes here!

Use the piecewise function to evaluate the following.

1.
$$f(x) = \begin{cases} -2x^2 - 1, & x \le 2 \\ \dfrac{4}{5}x - 4, & x > 2 \end{cases}$$

a. $f(0) =$

b. $f(5) =$

c. $f(2) =$

d. $f(-3) =$

2.
$$f(x) = \begin{cases} x^3 - 7x, & x \le -3 \\ 8, & -3 < x \le 3 \\ \sqrt{2x + 3}, & x > 3 \end{cases}$$

a. $f(-5) =$

b. $f(11) =$

c. $f(0) =$

d. $f(3) =$

3.
$$f(x) = \begin{cases} \dfrac{3}{x + 4}, & x < -5 \\ x^2 - 3x, & -5 < x \le 0 \\ x^4 - 7, & x > 0 \end{cases}$$

a. $f(-1) =$

b. $f(4) =$

c. $f(-10) =$

d. $f(0) =$

4.
$$f(x) = \begin{cases} |2x + 7|, & x \le -4 \\ 1 + x^2, & -4 < x \le 1 \\ 6, & 1 < x < 3 \\ \dfrac{1}{3}x + 8, & x \ge 3 \end{cases}$$
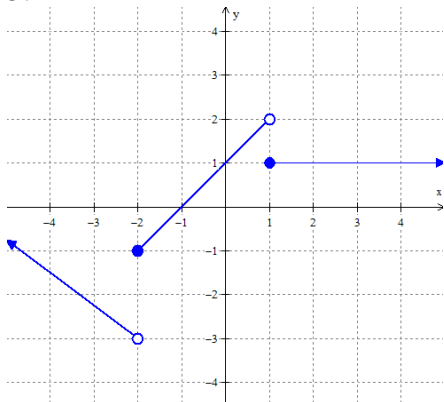
a. $f(5) =$

b. $f(1) =$

c. $f(-4) =$

d. $f(2) =$
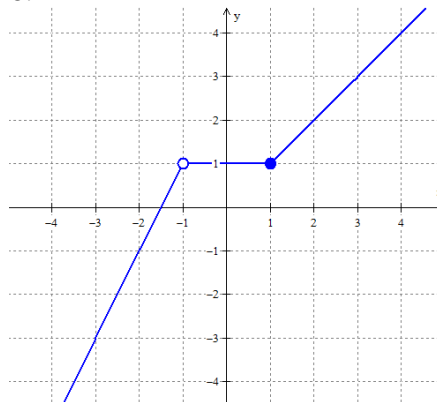
5.

a. $f(-1) =$

b. $f(2) =$

c. $f(1) =$

d. $f(-2) =$

e. $f(0) =$

6.

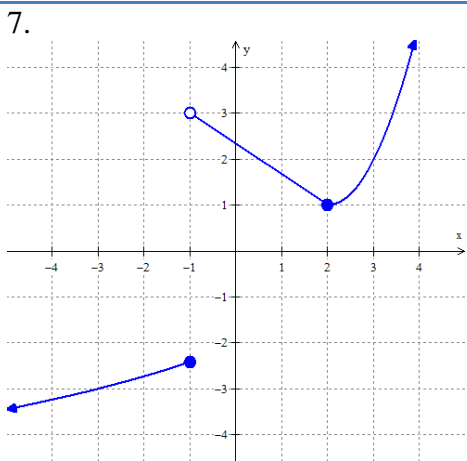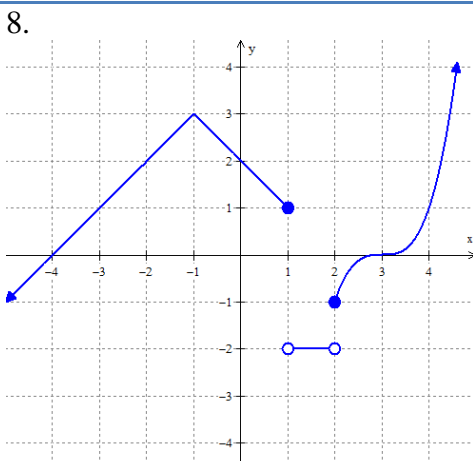

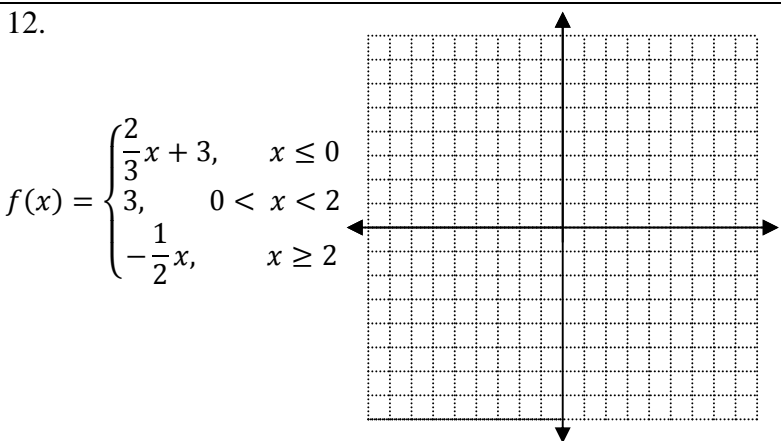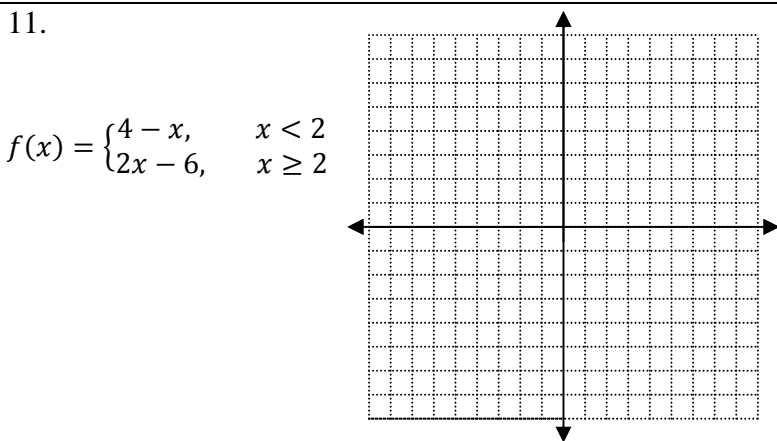a. $f(-3) =$

b. $f(4) =$

c. $f(1) =$

d. $f(-1) =$

e. $f(0) =$
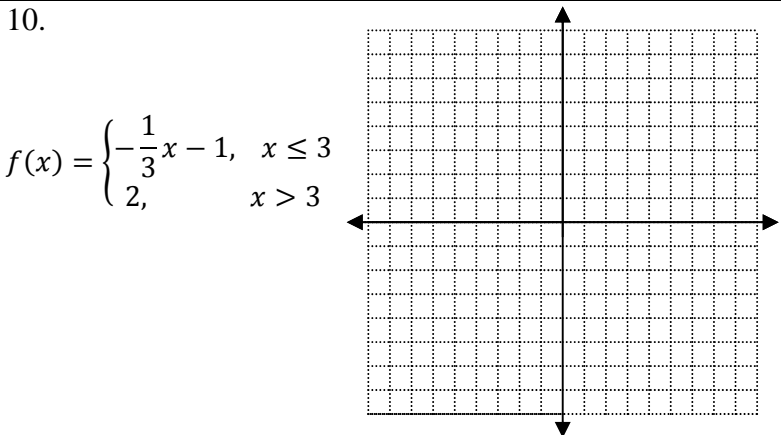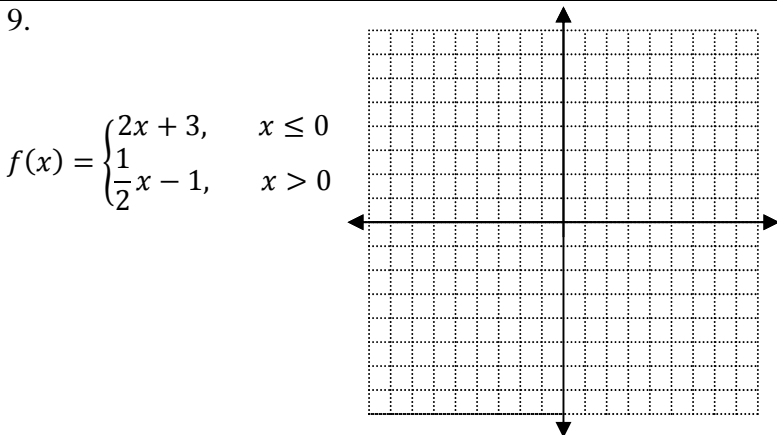
7.

a. $f(3) =$

b. $f(-1) =$

c. $f(-3) =$

d. $f(2) =$

e. $f(0.5) =$

8.

a. $f(-4) =$

b. $f(1) =$

c. $f(3) =$

d. $f(2) =$

e. $f(1.5) =$

Graph the following piecewise functions.

9.

$$f(x) = \begin{cases} 2x + 3, & x \le 0 \\ \dfrac{1}{2}x - 1, & x > 0 \end{cases}$$

10.

$$f(x) = \begin{cases} -\dfrac{1}{3}x - 1, & x \le 3 \\ 2, & x > 3 \end{cases}$$

11.

$$f(x) = \begin{cases} 4 - x, & x < 2 \\ 2x - 6, & x \ge 2 \end{cases}$$

12.

$$f(x) = \begin{cases} \dfrac{2}{3}x + 3, & x \le 0 \\ 3, & 0 < x < 2 \\ -\dfrac{1}{2}x, & x \ge 2 \end{cases}$$

ALGEBRA SKILLZ!

GRAPH	SIMPLIFY	SOLVE

GRAPH

a. $f(-1) =$

b. y-intercept $=$

c. $f(x) = 1$ when $x =$

d. x-intercept(s) $=$

SIMPLIFY

Simplify the radical.

a. $\sqrt{24}$

b. $4\sqrt{40}$

SOLVE

Solve for x.

a. $15 = \dfrac{5}{x} + 4$

FACTOR

b. $x^2 - 12x + 35$

1. Use the piecewise function to evaluate the following.

$$f(x) = \begin{cases} \dfrac{3}{x-2}, & x < -3 \\ 2x^2 - 3x, & -3 < x \le 6 \\ 8, & x > 6 \end{cases}$$
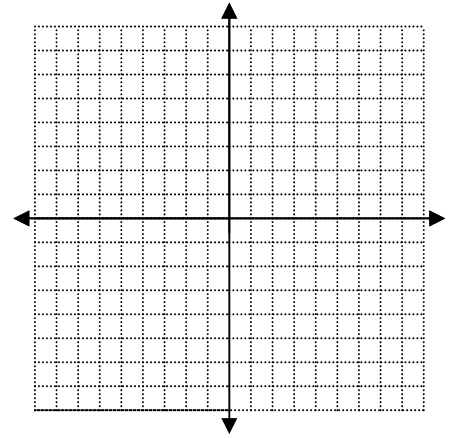
a. $f(-1) =$

b. $f(-4) =$

c. $f(9) =$

d. $f(6) =$

2. Graph the following piecewise function.

$$f(x) = \begin{cases} -\dfrac{1}{3}x - 2, & x \le 0 \\ \dfrac{1}{2}x + 1, & x > 0 \end{cases}$$

3. **NUMERICALLY** Use the piecewise function to fill in the table.

$$f(x) = \begin{cases} -x + 4, & x \le 0 \\ -3x + 18, & x > 0 \end{cases}$$

x	f(x)
-2	
0	
1	
	-12
	9

4. **GRAPHICALLY** Sully's blood pressure changes throughout the school day. Sketch a graph of his blood pressure over time. LABEL THE GRAPH! Let x stand for the time since 0800, so 1000 would be $x = 2$, 1200 would be $x = 4$, etc…
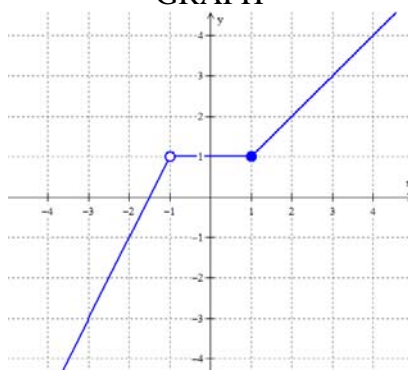
Sully's Day

- Sully's blood pressure starts at 90 and rises 5 points every hour for the first 4 hours.

- Sully chills out for lunch from 12-1 and maintains a cool 110 blood pressure.

- Last period of the day hits from 1-3 and Sully's blood pressure rises from 110 at 10 points per hour.

- School ends and Sully's blood pressure starts dropping 2 points per hour until his 8 o'clock bedtime.
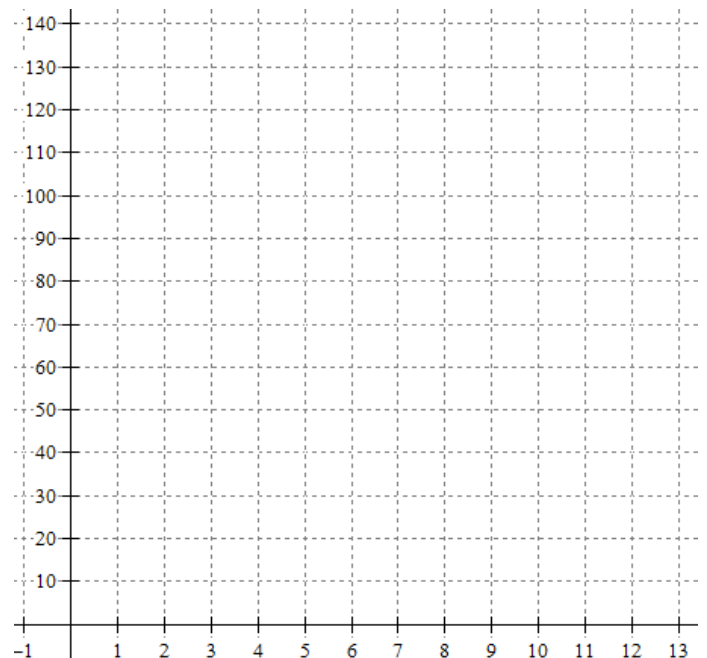
5. **ALGEBRAICALLY** Use the picture of the piecewise function to answer the following.

GRAPH	Equation of the pieces	Domain for the pieces	Piecewise function
			$f(x) =$

6. **VERBALLY** Mr. Brust wants to make t-shirts for his Algebra 2 students (shown below). Custom Ink will make the shirts and sell them at the following prices. Write a piecewise function to represent cost, y in dollars and t-shirts, x. Graph it! Label the graph!
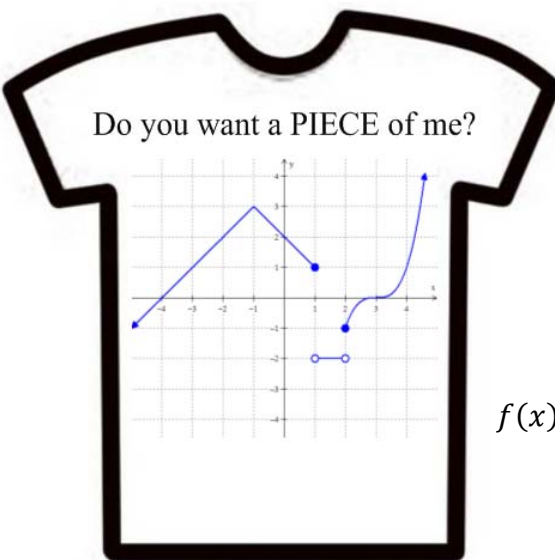
0-20 shirts = $25 each
21-30 shirts = $20 each
31-50 shirts = $15 each
51+ shirts = $10 each

Do you want a PIECE of me?

$f(x) =$
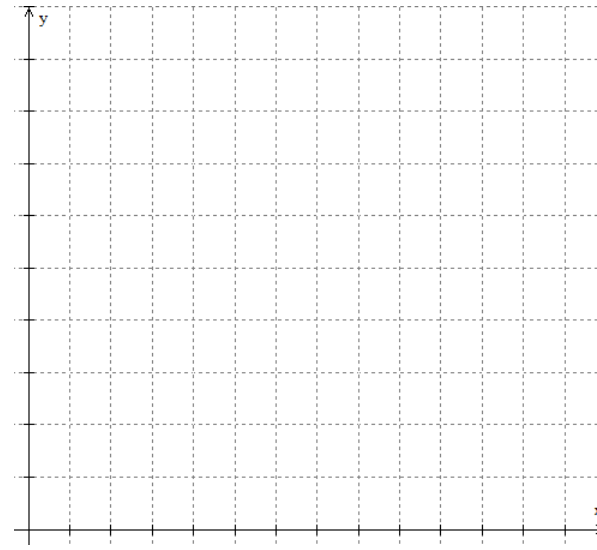
7. **SAT PREP** Below are sample SAT questions. The SAT is the main standardized test that colleges look at for admission. One is multiple choices; the other is free response where you must grid in your answer. Blow it up.

MULITPLE CHOICE	GRID IN
A regulation for riding a certain amusement park ride requires that a child be between 30 inches and 50 inches tall. Which of the following inequalities can be used to determine whether or not the child's height h satisfies the regulation for this ride? (A) $\|h - 10\| < 50$ (B) $\|h - 20\| < 40$ (C) $\|h - 30\| < 20$ (D) $\|h - 40\| < 10$ (E) $\|h - 45\| < 5$	If $x < 0 < y$, find the value of $x + y$ given: $2\|x - 9\| = 24$ $\|xy\| = 15$