

Algebra 2 - Test Review Problems, revision 2008-10-23

Textbook sections 1.7, 2.2-2.4, 2.7, 2.8

Only use calculators on the word problems!

- Answer these questions about the function $g(x) = -1.5x + 4$
 - What is/are the zero(s) of $g(x)$?
 - What is $g(3)$?
 - Solve: $g(x) = 18$.
 - Solve: $g(x) < 7$.
 - On graph of $g(x)$, a point has an x -coordinate of 8. What is its y -coordinate?
- The tables of values below show some of the inputs and outputs for the functions $f(x)$ and $g(x)$. Which one of these has a graph that is a line?

x	$f(x)$
-3	8
4	7
11	6
15	5
16	4

x	$g(x)$
-3	15
-1	12
3	6
5	3
11	-6

- For whichever one function in problem 2 above was a line, answer the following questions:
 - What is the equation that defines that function?
 - What are the exact coordinates of the x - and y -intercepts of the graph of that function?
 - What is the input that makes the output equal to 25?
 - What is the y -coordinate of the point on the graph that has an x -coordinate of 20?
- Write an equation for each of the given lines. You may use either point-slope form or slope-intercept form unless the form is specified. Think carefully about which form will be easier.
 - Slope is 2 and y -intercept is 6
 - Slope is -1 and goes through the point $(6,3)$ (point-slope form)
 - Goes through the points $(0,4)$ and $(-2,-6)$
 - Horizontal line through $(3,4)$
 - Vertical line through $(-2,5)$
 - Parallel to $y = 3x + 2$ and goes through $(-2,3)$ (point-slope form)
 - Perpendicular to $y = -0.5x - 2$ and goes through $(0,6)$ (point-slope form)
- Line A goes through the points $(5,2)$ and $(-1,6)$. Line B is parallel to line A, but its x -intercept is three units to the right of line A's. What is the y -intercept of line B?
- Write the equation of a linear function $f(x)$ where $f(5) = 11$ and $f(-2) = 8$.
- A linear function $g(x)$ has a zero of 7. Also, $g(2) = 13$. What is $g(x)$?

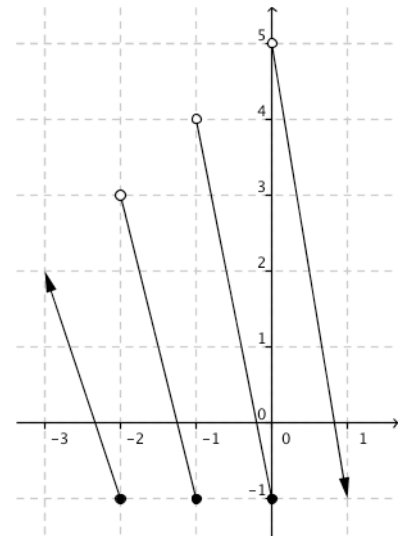
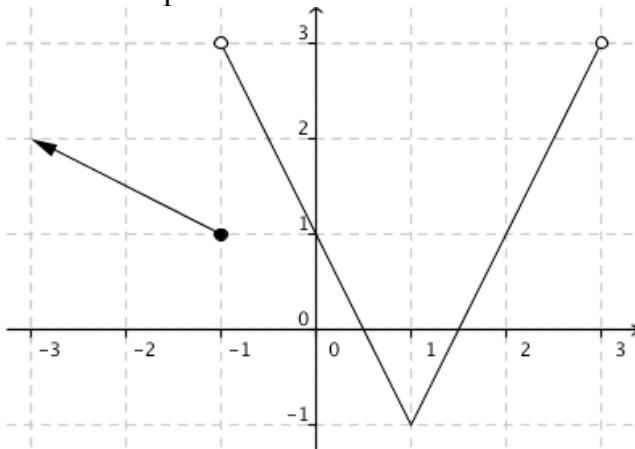
8. Neatly graph each of the following piecewise functions. Use graph paper and a ruler. Since all of the parts will graph as lines, try to rely more on your knowledge of how the graphs of lines work, rather than using tables extensively.

$$\text{a. } f(x) = \begin{cases} -\frac{1}{2}x + 2 & \text{if } x \leq 2 \\ x - 3 & \text{if } x > 2 \end{cases}$$

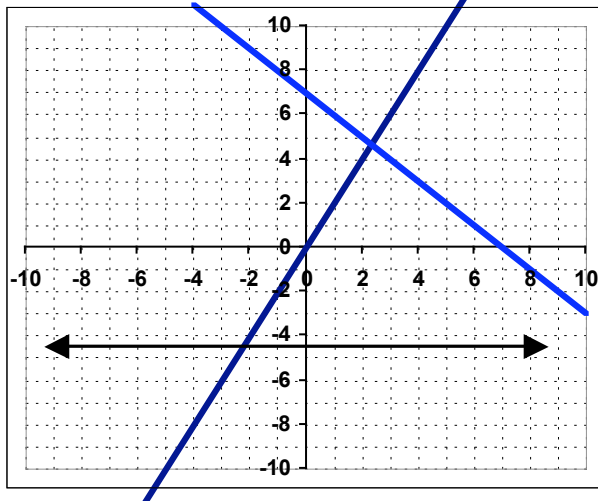
$$\text{b. } g(x) = \begin{cases} 2 & \text{if } -6 \leq x < -3 \\ -4 & \text{if } -3 \leq x < 3 \\ -\frac{1}{3}x + 2 & \text{if } x \geq 3 \end{cases}$$

$$\text{c. } h(x) = \begin{cases} 2 & \text{if } 0 \leq x < 2 \\ 3 & \text{if } 2 \leq x < 4 \\ 4 & \text{if } 4 \leq x < 6 \end{cases}$$

9. Write a piecewise function for each of the following graphs.



10. Write an equation for each of the lines graphed below.



11. After printing 200 pages, a printer has 50 ml of toner left. After printing 350 pages, there are only 30 ml of toner left. Write a function that gives the amount of toner left as a function of the number of pages printed. Call this function $t(x)$.

- What is the slope? What does it mean in the context of this situation?
- How much toner was there before any pages were printed?
- How many pages could you print before running out of toner?

In the relation between pages printed (x) and toner left (y), what is the slope? What is the meaning of the slope in this situation (what are its units)?

12. A train is coming towards Boston at the speed of 60 miles per hour. Three hours after it departs it is 650 miles away.

- Write an equation showing distance from Boston $D(t)$ as a function of the hours after departure (t).
- Graph it.
- Solve $D(t)=150$. What meaning does this have in the problem?
- When will it arrive in Boston?
- What is the y -intercept on the graph of $D(t)$? What is its meaning in this problem?

13. Liz is running a race. Sixteen minutes after the start of the race she has 4 miles until the finish line. Thirty minutes after the start of the race she has 2 miles until the finish line. Assume a linear relationship.

- Write an equation showing the distance Liz has to go $D(t)$ as a function of the time since the start of the race (t).
- What are the units of the slope?
- Graph the equation.
- Evaluate $D(7)$. What meaning does it have in this problem?
- What is the zero of $D(t)$ and what meaning does it have in this problem?
- How long is the race?

14. Solve each of the following equations.

a. $2|3x - 1| - 4 = 10$

b. $\left|\frac{1}{3}x - \frac{1}{2}\right| = \frac{2}{5}$

c. $|x - 7| + 3 \leq 2$

d. $5|x - 1| + 4 = 19 + 2|x - 1|$

15. (optional) Solve each of the following inequalities. Then graph your solution on the number line.

a. $|3x + 6| \leq 15$

b. $2|x - 3| + 5 > 11$

c. $5 \leq |3x + 1|$

d. $4|3x - 7| + 11 < 9$

16. Neatly graph each of the following functions. Then find the domain, range, and zeros.

a. $f(x) = 2|x - 3| - 4$

b. $g(x) = -\frac{3}{2}|x + 4| - 1$

The following are more problems on finding the equation of an absolute value graph. Use graph paper and a ruler to help you as you are working through these.

17. Suppose $f(x)$ is an absolute value function of the form $f(x) = a|x - h| + k$. The vertex of $f(x)$ is $(4, 4)$ and the graph of $f(x)$ goes through the point $(5, 2)$,

a. Write a formula for $f(x)$.

b. Write a piecewise function for $f(x)$ that does not explicitly use absolute value.

18. Suppose $m(x)$ is an absolute value function of the form $m(x) = a|x - h| + k$. $m(x)$ has its y-intercept at $(0, 3)$ and the only x-intercept is $(2, 0)$.

a. Write a formula for $m(x)$.

b. Write a piecewise function for $m(x)$ that does not explicitly use absolute value.

19. Graph the (nonlinear) function $f(x) = (1/2)x^2$ for x between -2 and 2 , inclusive. Use "brute force": graph at least the points $(-2, f(-2))$, $(-1, f(-1))$, \dots , $(2, f(2))$. Calculus tells us that the tangent line to that curve at the point $(1, f(1))$ has a slope of 1.

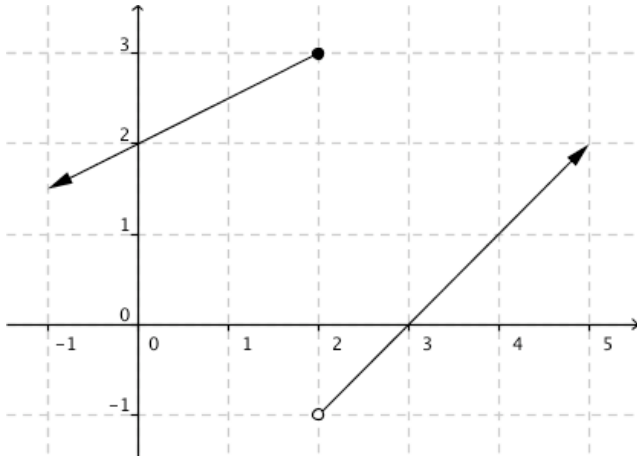
a. Write an equation for that tangent line in point-slope form.

b. Graph that tangent line on the same graph as your graph of f and notice that it appears to be tangent to the graph of f .

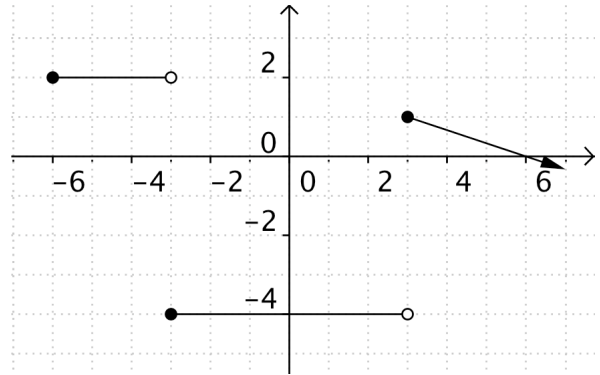
Review Sheet Answers (subject to error, as always)

1. a. $x=8/3$ b. -0.5 c. $-28/3$ d. $x>-2$ e. -8
 2. $g(x)$ is a line; $f(x)$ is not
 3. a. $g(x)=-1.5x+10.5$ b. x-int is $(7,0)$; y-int is $(0,10.5)$ c. $-29/3$ d. -19.5
 4. These can be written in many forms. One form of each is:
 a. $y = 2x + 6$ b. $y - 3 = -(x - 6)$ c. $y - 4 = 5x$ d. $y = 4$
 e. $x = -2$ f. $y - 3 = 3(x + 2)$ g. $y - 6 = 2x$
 5. $y = -\frac{2}{3}(x - 11)$ 6. $f(x) = \frac{3}{7}x + \frac{62}{7}$ 7. $f(x) = \frac{-13}{5}x + \frac{91}{5}$

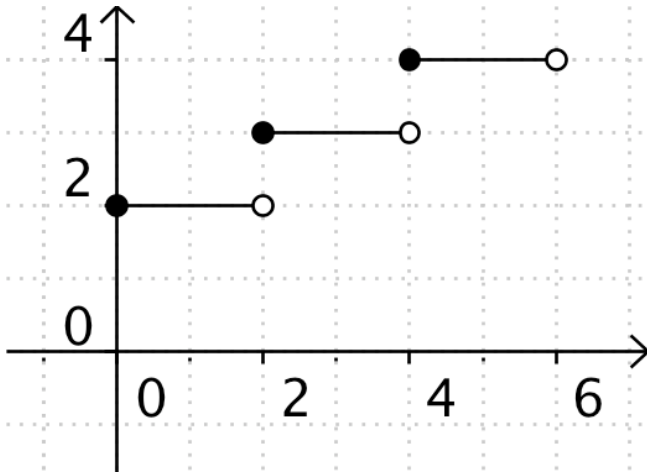
8a.



8b.



8c.



$$9a. f(x) = \begin{cases} -\frac{1}{2}x + \frac{1}{2} & \text{if } x \leq -1 \\ -2x + 1 & \text{if } -1 < x \leq 1 \\ 2x - 3 & \text{if } 1 < x \end{cases}$$

$$b. f(x) = \begin{cases} -3(x + 2) - 1 & \text{if } x \leq -2 \\ -4(x + 1) - 1 & \text{if } -2 < x < -1 \\ -5x - 1 & \text{if } -1 < x \leq x < 6 \\ -6(x - 1) - 1 & \text{if } x > 0 \end{cases}$$

10. Lines are $y=-6$; $y=-x+7$; and $y=2x$

11a. $t(x) = -\frac{2}{15}x + 63\frac{1}{3}$ slope = $-2/15$ means every page takes $2/15^{\text{th}}$ of a ml of toner

b. $63\frac{1}{3}$ ml c. 425 pages

12. a. $D(t) = -60t + 830$

b.



c. $11\frac{1}{3}$ hours after departure it is 150 miles from Boston

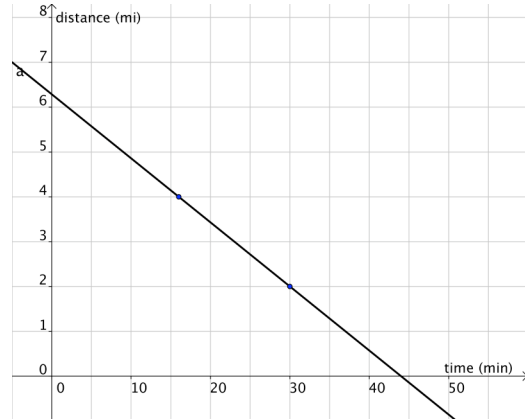
d. 13.83 hours after departure

e. (0,830) it stated 830 miles from Boston

13. a. $D(t) = -\frac{1}{7}t + \frac{44}{7}$

b. miles per minute

c.



d. $D(7) = 5.28$ miles; 7 minutes into the race she has this far to go

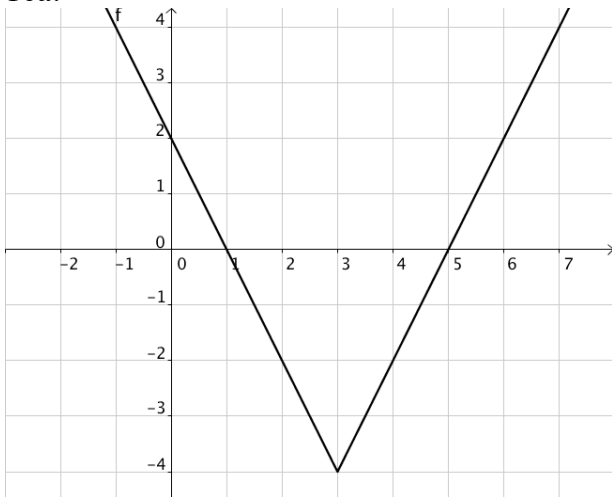
e. $t = 44$ is zero; after 44 minutes she is finished

f. when $t = 0$ $D(t) = 44/7$ or 6.28 miles to go

14a. $x = \frac{8}{3}$ or $x = -2$ b. $x = \frac{27}{10}$ or $x = \frac{3}{10}$ c. No solution d. $x = 6$ or $x = -4$

15a. $-7 \leq x \leq 3$ b. $x > 6$ or $x < 0$ c. d. No solution

16a.



Domain: All real numbers

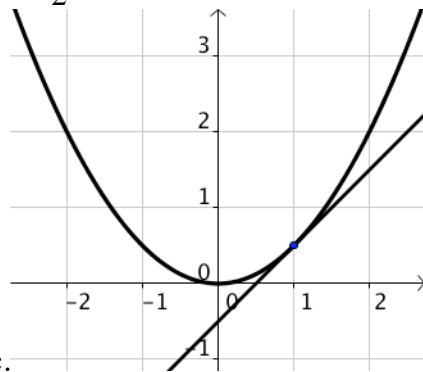
Range: $y \geq -4$

Zeros: 1 and 5

17a. $f(x) = -2|x-4| + 4$ b. $f(x) = \begin{cases} 2x-4 & \text{if } x < 4 \\ -2x+12 & \text{if } x \geq 4 \end{cases}$

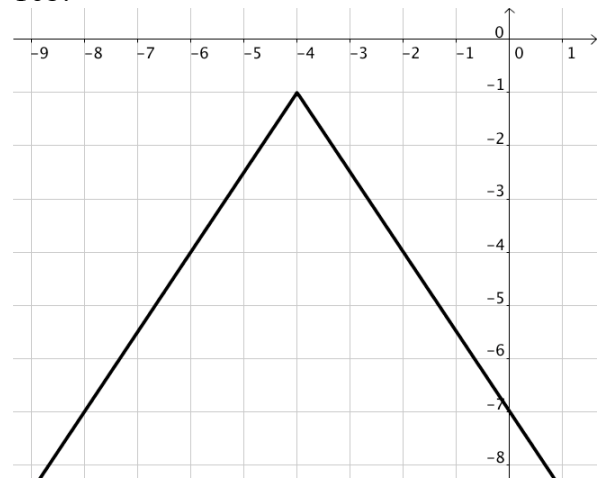
18a. $m(x) = \frac{3}{2}|x-2|$ b. $m(x) = \begin{cases} -\frac{3}{2}x+3 & \text{if } x < 2 \\ \frac{3}{2}x-3 & \text{if } x \geq 2 \end{cases}$

19b. $y - \frac{1}{2} = x - 1$



19a,c.

16b.



Domain: All real numbers

Range: $y \leq -1$

Zeros: No zeros