QUIZ #1 Solutions

Section 0.1 #6: Fig. 10 shows temperatures during the month of November.

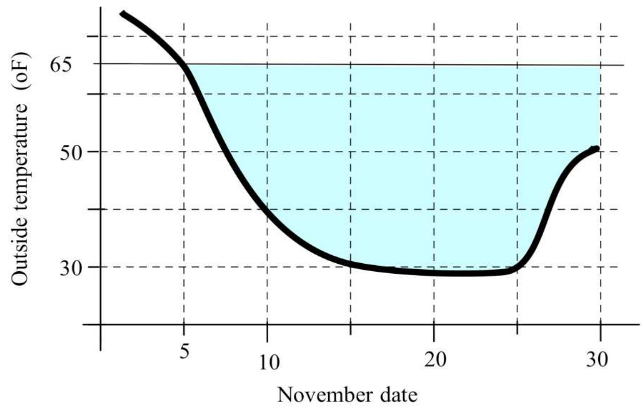


Fig. 10

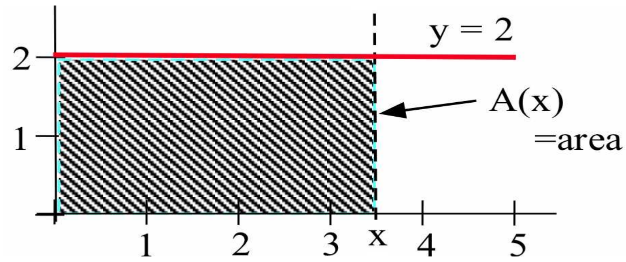
(a) Approximate the shaded area between the temperature curve and the 65° line from Nov. 15 to Nov. 25.
(b) The area of the "rectangle" is (base)(height) so what are the units of your answer in part (a)?
(c) Approximate the shaded area between the temperature curve and the 65° line from Nov. 5 to Nov. 30.
(d) Who might use or care about these results?
(a) There are approximately 2 columns of 3.5 squares for a total of 7 rectangles.
(b) Each rectangles is 5 days by 10 degrees or 50 day-degrees
(c) The shaded area is approximately 13 1/4 rectangles.
(d) Farmers, Thanksgiving holiday travelers, or meteorologists might care.

Section 0.2 #18: Find a value for the constant (A, B or D) so that:
(a) the line $y = 2x + A$ goes through (3, 10).
(b) the line $y = Bx + 2$ goes through (3, 10).
(c) the line $y = Dx + 7$ crosses the y-axis at the point (0, 4).
(d) the line $Ay = Bx + 1$ goes through the points (1, 3) and (5, 13).
(a) Substitute x = 3 and y = 10 in the equation to obtain $10 = 2*3 + A \Rightarrow A = 10 - 6 = 4$
(b) Substitute x = 3 and y = 10 in the equation to obtain $10 = B*3 + 2 \Rightarrow B = (10 - 2)/3 = 8/3$
(c) Substitute x = 0 and y = 4 in the equation to obtain $4 = D*0 + 7$ is impossible to solve
(d) Substitute x = 1 and y = 3 then substitute x = 5 and y = 13 into the equation to obtain

$$A*3 = B*1 + 1 \text{ and } A*13 = B*5 + 1 \Rightarrow \begin{aligned} 3A - B &= 1 \\ 13A - 5B &= 1 \end{aligned}$$

Subtract to obtain $-10A + 4B = 0$. Thus $B = 10A/4 = 5A/2$.
Substitute to obtain $3A = 5A/2 + 1 \Rightarrow A/2 = 1 \Rightarrow A = 2 \Rightarrow B = 5$.

Section 0.3 #20: Define $A(x)$ to be the area of the rectangle bounded by the coordinate axes, the line $y = 2$ and a vertical line at x, as shown below. For example, $A(3)$ = area of a 2×3 rectangle = 6.



(a) Evaluate $A(1)$, $A(2)$ and $A(5)$.

(b) Find a formula for $A(x)$.

(a) $A(1) = 2 * 1 = 2$, $A(2) = 2 * 2 = 4$, $A(5) = 2 * 5 = 10$

(b) $A(x) = 2x$

Section 0.4 #8: Defining $h(x) = 3$, $f(x)$ and $g(x)$ as:

$$f(x) = \begin{cases} x+1 & if\ x<1 \\ 1 & if\ 1 \le x < 3 \\ 2-x & if\ 3 \le x \end{cases} \qquad g(x) = \begin{cases} |x+1| & if\ x<0 \\ 2x & if\ 0 \le x \end{cases}$$

(a) evaluate $f(x)$, $g(x)$ and $h(x)$ for x = – 1, 0, 1, 2, 3 and 4.

(b) evaluate $f(g(1))$, $f(h(1))$, $h(f(1))$, $f(f(2))$, $g(g(3.5))$.

(c) graph $f(x)$, $g(x)$ and $h(x)$ for $-5 \le x \le 5$.

(a) Substitute the values for x in the functions to obtain:

x	$f(x)$	$g(x)$	$h(x)$
– 1	0	0	3
0	1	0	3
1	1	2	3
2	1	4	3
3	– 1	6	3
4	– 2	8	3

(b) Use the values from the table in part (a) to obtain

$f(g(1)) = f(2) = 1$

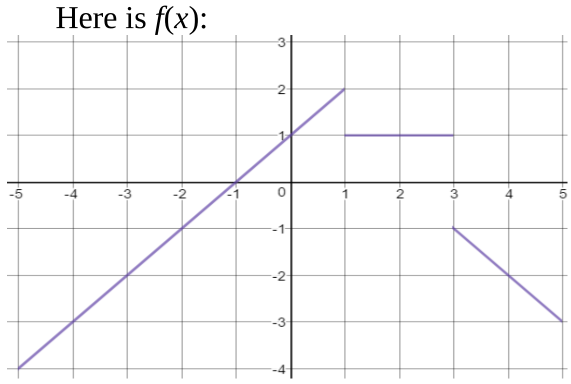
$f(h(1)) = f(3) = -1$

$h(f(1)) = h(1) = 3$

$f(f(2)) = f(1) = 1$

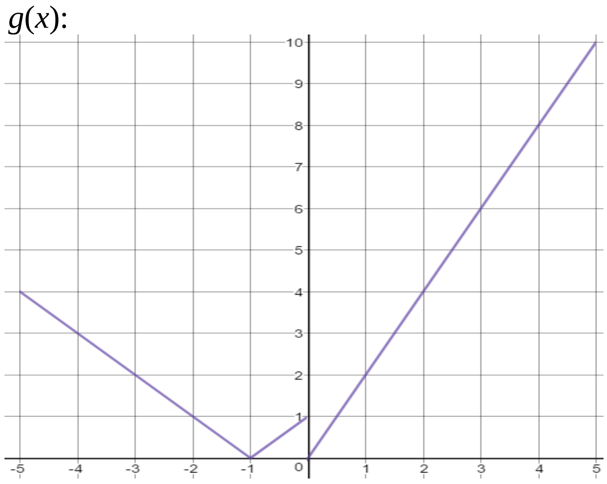
$g(g(3.5)) = g(7) = 14$

(c) Here is $f(x)$:



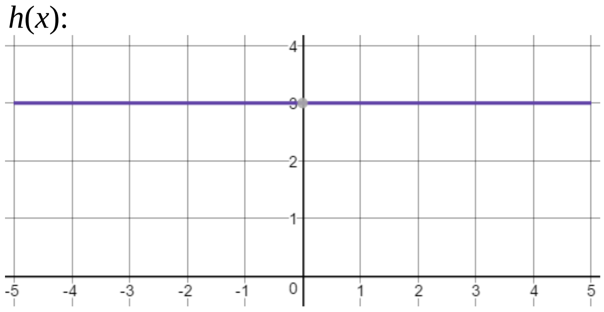
There should be an open circle at (1,2) and (3,1)

Here is $g(x)$:



There should be an open circle at (0,1)

Here is $h(x)$:



Section 0.5 #20: Determine whether the statement is true or false. If the statement is false, give a counterexample.

(a) For all real numbers a and b, $|a+b|=|a|+|b|$

(b) For all real numbers a and b, $\lfloor a \rfloor + \lfloor b \rfloor = \lfloor a+b \rfloor$

(c) If $f(x)$ and $g(x)$ are linear functions, then $f(g(x))$ is a linear function.

(a) false, if a = 2, b = – 1, then | 2 + – 1 | = 1 but |2| + |– 1| = 3

(b) false, if a = 1.6 and b = 1.5, then $\lfloor 1.6 \rfloor + \lfloor 1.5 \rfloor = 1+1=2$ but $\lfloor 1.6+1.5 \rfloor = \lfloor 3.1 \rfloor = 3$

(c) true