Unit 11 Review Solutions

1) $g(2) = 5f(2) + 1 = 5 \cdot -8 + 1 = -40 + 1 = -39$. **The correct answer is Option 1**. Option 2 uses a value of 8 instead of -8, Option 3 neglects to add the 1 at the end, and Option 4 fails to evaluate $f(2)$ first, instead just evaluating $5 \cdot 2 + 1$

2) The dashed parabola has been reflected over the x-axis and either vertically shrunk or horizontally stretched (either would work). **The correct answer is Option 3**. Option 1 has a vertical translation up 1 that is not shown in the graph, Option 2 is still negative (when it should be positive), and Option 4 would give a horizontal shrink instead of a horizontal stretch.

3) The vertex has an x-coordinate that is always found exactly halfway between the roots. **The correct answer is Option 1**. Option 2 would have a vertex with *x*-coordinate of 0, Option 3 gives values centered around the *y*-coordinate, and Option 4 would have a vertex with *x*-coordinate of 4.

4) Comparing the equation given to the general % change form $f(x) = b(1-r)^x$, we can see the starting value is 130 and the value of r must be 0.06. **The correct answer is Option 3**. Option 1 implies the 94% is the amount that is melting as opposed to the amount that *remains* every minute, Option 2 confuses the *y*-intercept at the common multiplier, and Option 4 implies the function is linear.

5) Use the table

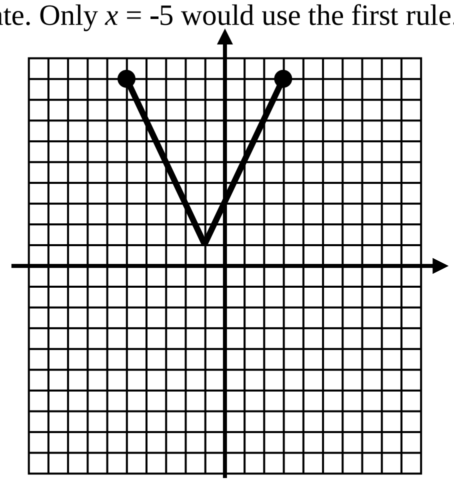
x	***y***
-3	9
4	-4

and the formula $\frac{\Delta y}{\Delta x}$. **The correct answer is Option 1**. Option 2 uses only the top rule for both values of *y*, Option 3 uses only the bottom rule for both values of *y*, and Option 4 mistakenly evaluates the bottom expression for *x* = -3 and the top expression for *x* = 4.

6) A reflection over the *x*-axis requires a negative sign *outside* the function, and a horizontal stretch requires *k* in the expression $f(k \cdot x)$ to be *less than* 1. **Option 2 is the correct answer**. Option 1 would result in a horizontal *shrink* by a factor of 2, Option 3 would result in a reflection over the *y*-axis and a *vertical* stretch by a factor of 2, and Option 4 produces the proper horizontal stretch, but reflects the function over the *y*-axis as well.

7a) $f(3) = 9$; $f(0) = 3$; $f(-5) = 9$; $f(-1) = 1$. *x* = 3, 0, and -1 are all $\geq$ -1, so they all use the second rule to evaluate. Only *x* = -5 would use the first rule.

7b)



Graph both *y* = -2*x* – 1 and *y* = 3 + 2*x* and use the first for *x*-values from -5 to -1 and the second rule for *x*-values from -1 to 3.

7c) Average rate of change = slope = $\frac{\Delta y}{\Delta x} = \frac{0}{8} = 0$

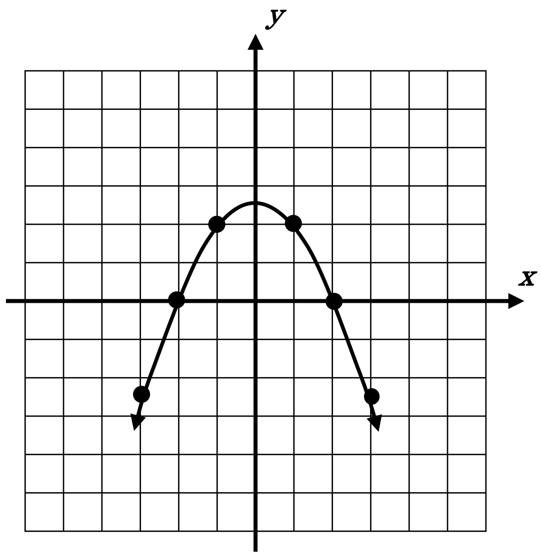
8a) $g(x)$ is defined using $f(x)$. It passes a number to $f(x)$, telling it to subtract 1 from that number first. Then $f(x)$ looks up that number on its graph, passing that back to $g(x)$, which multiplies it by -1/2. For $g(0)$, $f(x)$ will look up $f(-1)$ and find -5. $g(x)$ multiplies that by -1/2 and gets -2.5.

$$g(0) = -\frac{1}{2} f(0-1) = -\frac{1}{2} f(-1) = -\frac{1}{2}(-5) = 2.5$$

$$g(1) = -\frac{1}{2} f(1-1) = -\frac{1}{2} f(0) = -\frac{1}{2}(-4) = 2$$

$$g(-3) = -\frac{1}{2} f(-3-1) = -\frac{1}{2} f(-4) = -\frac{1}{2}(5) = -2.5$$

8b)



8c) The -1/2 will produce a reflection over the x-axis and a vertical shrink by ½. The (x – 1) inside $f(x)$ will produce a translation right 1

8d) $y \le 2.5$

8e) All real numbers

9a) Between linear and exponential regressions, the exponential regression shows an r-value closer to -1 and a residuals plot that is randomly scattered and shows no pattern. The proper equation is $y = 180.377(0.954)^x$

9b) $y = 180.377(0.954)^{13} = 97.7935 \approx 97.8$ degrees Fahrenheit

10)

$m(x)$ shows a translation 3 to the right and 3 up, so $m(x) = f(x-3) + 3 = g$

$r(x)$ shows a reflection over the x-axis, a translation 5 to the right and 2 up, so $r(x) = -f(x-5) + 2 = d$

$h(x)$ shows a translation 3 up, so $h(x) = f(x) + 3 = c$

$k(x)$ shows a translation 2 up and a horizontal stretch by 2, so $k(x) = f\left(\frac{1}{2}x\right) + 2 = e$

$d(x)$ shows a reflection over the x-axis, so $d(x) = -f(x) = b$

$g(x)$ shows a translation 2 to the left, so $g(x) = f(x+2) = a$