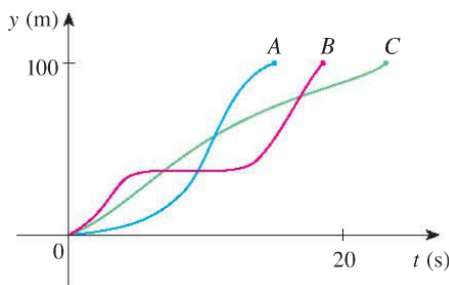


Turn in the following problems:

- Fill in the blank with “all”, “no”, or “some” to make the following statements true.
 - If your answer is “all”, explain why.
 - If your answer is “no”, give an example and explain.
 - If your answer is “some”, give two examples that demonstrate when the statement is true and when it is false. Explain your examples.

Note: An example must include either a graph or a specific function.

- For _____ real numbers x , $(x + 2)^4 = x^4 + 16$.
 - For _____ real numbers x , $\sqrt{x^4 + 8x^2 + 16} = x^2 + 4$.
 - For _____ real numbers x , if $(x + 2)(x - 3) = 2$, then $x + 2 = 2$ and $x - 3 = 2$.
 - For _____ functions f and g , if f and g are both even functions, then $f + g$ is even.
 - For _____ values of k , x , and y , if $x < y$, then $kx < ky$ where k is a constant.
- An electricity company charges its customers a fixed base charge of \$6 a month, plus 10 cents per kilowatt-hour (kWh) for the first 500 kWh, 11 cents per kWh for the next 500 kWh, and 15 cents for all additional kWh.
 - Express the monthly cost E as a function of the amount x of electricity used.
 - Graph the function E for $0 \leq x \leq 2000$.
 - Explain how your graph represents your function E .
 - Three runners compete in a 100-meter race. The graph depicts the distance run as a function of time for each runner.
 - What does the graph tell you about runner B’s pace?
 - Who won the race? Explain.
 - Did each runner finish the race? Explain.



4. In September, Lee ran in the Run Rabbit Run 50 mile race in Steamboat. The race is an out-and-back course that runs from Steamboat Ski Resort to Rabbit Ears and back to Steamboat Ski Resort. The table below provides the timed splits through the various aid stations along the course.

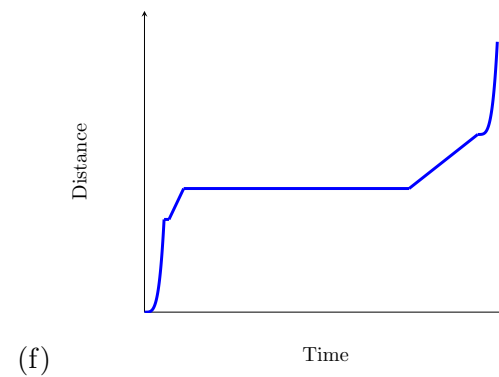
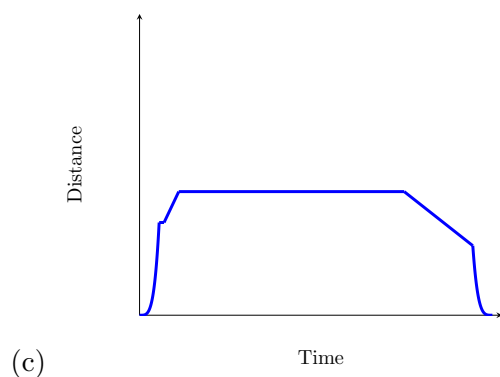
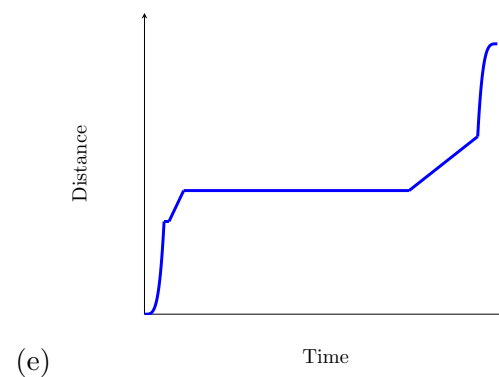
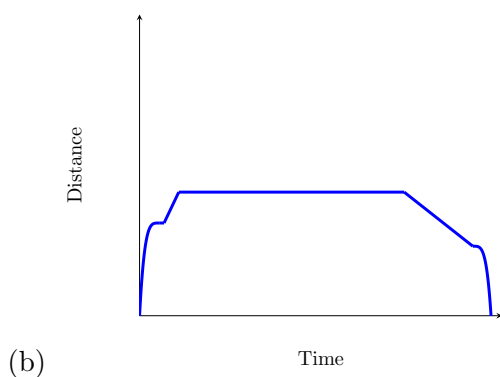
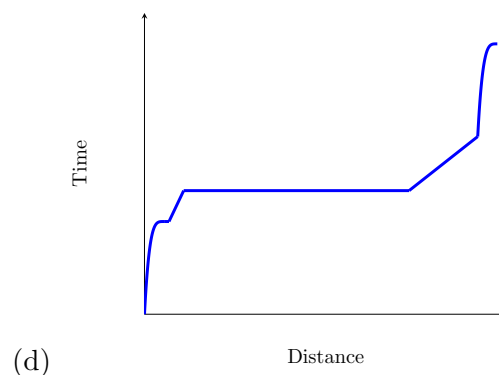
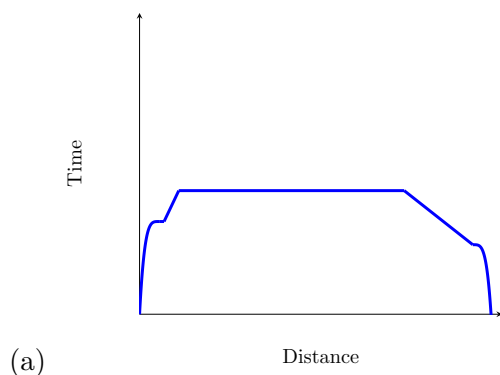
Time	Aid State (distance traveled from start)
0:00:00	Start (0 miles)
1:21:51	Mount Werner Aid Station (6.4 miles)
2:22:52	Long Lake Aid Station (13.2 miles)
3:34:36	Base Camp Trailhead Aid Station (18.4 miles)
4:05:34	Dumont Aid Station (22.3 miles)
4:45:25	Rabbit Ears (25 miles)
5:13:17	Dumont Aid Station (27.7 miles)
6:02:43	Base Camp Trailhead Aid Station (31.6 miles)
7:07:11	Long Lake Aid Station (36.8 miles)
8:41:37	Mount Werner Aid Station (43.6 miles)
9:29:13	Finish (50 miles)

- (a) List two different functions that can be formed from the data in the table. Be sure to specify the dependent and independent variables.
- (b) Name one way in which the data in the table is not a function. Explain.
- (c) Construct a graph that depicts the relationship between time and the total distance traveled in the race.
- (d) Construct a graph that depicts the relationship between time and displacement from start/finish (relative distance to start/finish).
- (e) Compare Lee's average running speed from Dumont to Rabbit Ears and his average running speed from Rabbit Ears to Dumont.
5. If you invest x dollars at 6% interest compounded annually, then the amount $A(x)$ of the investment after one year is $A(x) = 1.06x$.
- (a) Calculate $A \circ A(x)$, $A \circ A \circ A(x)$, and $A \circ A \circ A \circ A(x)$. What do these compositions represent?
- (b) Find a formula for the composition of n copies of A .

6. Athena is raising the Colorado state flag on the school's flagpole. This is her first time raising the flag, so she is excited and raises the flag faster and faster. Athena soon feels tired and pauses for a short break. Finally she finishes raising the flag to the top and a slower steady rate.

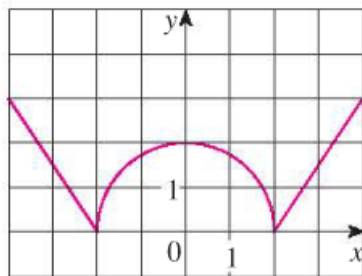
At the end of the day, Athena lowers the flag. At first she lowers it slowly at a constant rate, and then lowers the flag faster and faster until the flag comes all the way down.

Choose ONE of the graphs below that provides a graphical representation of the relationship between time and the total distance traveled by the flag. Explain how your choice represents each part of the scenario.

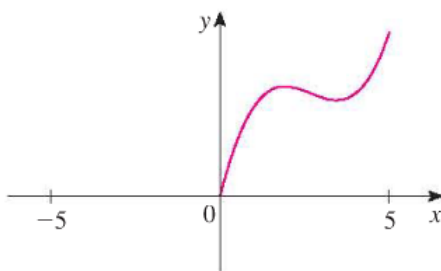


These problems will not be collected, but you are expected to solve. You might need the solutions during the semester:

7. Find the expression for the function whose graph is the given curve.



8. A function f has domain $[-5, 5]$ and a portion of its graph is shown.

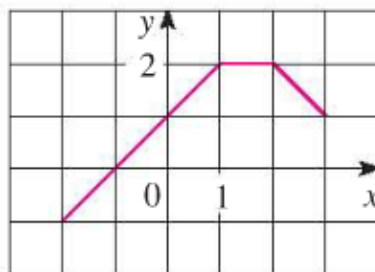


- (a) Complete the graph of f if it is known that f is even.
(b) Complete the graph of f if it is known that f is odd.

9. The monthly cost of driving a car depends on the number of miles driven. Lynn found that in May it cost her \$380 to drive 480 mi and in June it cost her \$460 to drive 800 mi.
- Express the monthly cost C as a function of the distance driven d , assuming that a linear relationship gives a suitable model.
 - Use part (a) to predict the cost of driving 1500 miles per month.
 - Draw the graph of the linear function. What does the slope represent?
 - What does C -intercept represent?
 - Why does a linear function give a suitable model in this situation?

10. The graph of f is given. Draw the graphs of the following functions.

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



11. A spherical balloon is being inflated and the radius of the balloon is increasing at a rate of 2 cm/s.
- Express the radius r of the balloon as a function of the time t (in seconds).
 - If V is the volume of the balloon as a function of the radius, find $V \circ r$ and interpret it.
12. If $f(x) = x + 4$ and $h(x) = 4x - 1$, find a function g such that $g \circ f = h$.

Optional Challenge Problem

Find a formula for a function $f(x)$ such that

- $f(3) = 0$
- $f(x)$ is even
- f has a horizontal asymptote at $y = 2$
- f has vertical asymptotes at $x = 4$ and $x = -4$
- $f(0) = 1$ (Meeting this requirement is the trickiest part!)