
Instructions: You have 25 minutes for this quiz. You **MUST** show work for credit. No credit for answers only. If in doubt, ask for clarification. Quiz has two problems. When appropriate, use at least two decimal places. Quiz is on THREE pages.

1. (6pts) A car leaves Seattle heading east. The speed of the car in mph after m minutes is given by the function

$$y = C(m) = \frac{100m^2}{12 + 2m^2} \text{ mph.}$$

- (a) (1pts) Find a function $m = f(s)$ that converts seconds s into minutes m .

$$m = f(s) = \frac{s}{60}; \text{ this is the conversion factor from } s \text{ seconds to } m \text{ minutes.}$$

- (b) (1pts) Find a function $z = g(y)$ that converts mph y into feet/sec z .

$$z = g(y) = \frac{5280y}{3600}; \text{ this is the conversion factor from } y \text{ mph to } z \text{ ft/sec}$$

- (c) (2pts) Write out the formula for the new function $g(C(f(s)))$.

$$g(C(f(s))) = g\left(C\left(\frac{s}{60}\right)\right) = g\left(\frac{100\left(\frac{s}{60}\right)^2}{12 + 2\left(\frac{s}{60}\right)^2}\right) = \frac{5280}{3600} \frac{100\left(\frac{s}{60}\right)^2}{12 + 2\left(\frac{s}{60}\right)^2}$$

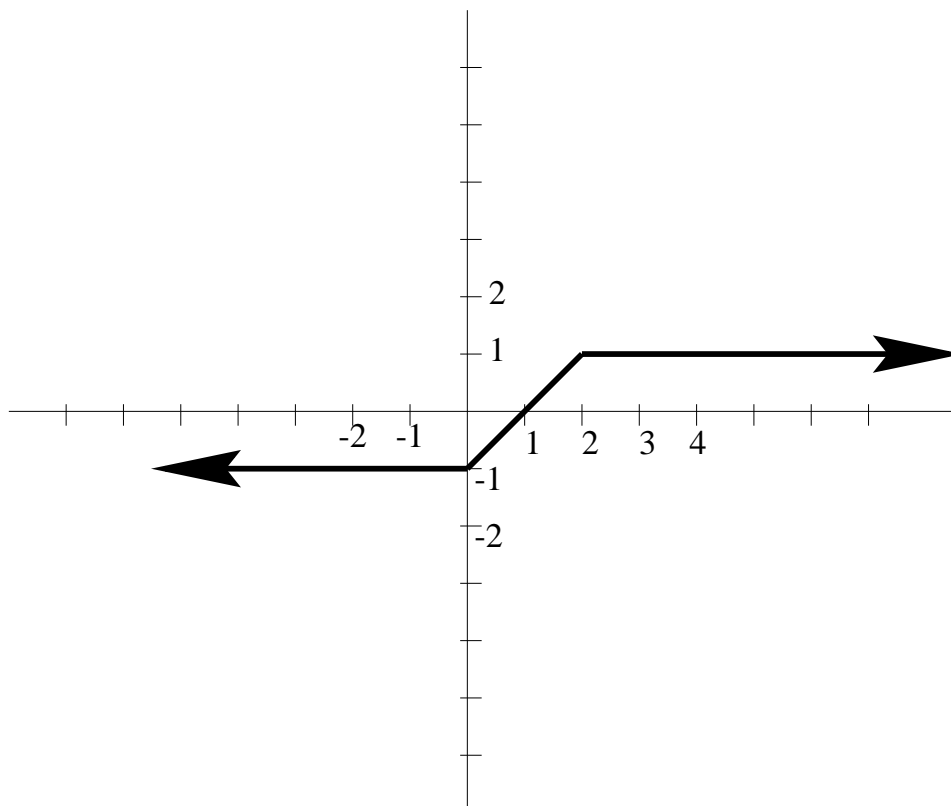
- (d) (2pts) Explain in words what $g(C(f(s)))$ calculates; make sure to specify the units on the input and output values.

$$z = g(C(f(s))) \text{ calculates the speed of the car } z \text{ in output units of FT/SEC in terms of input units of time in SECONDS.}$$

2. (14pts) Here is the multipart rule for a function $y = f(x)$:

$$f(x) = \begin{cases} -1 & \text{if } x \leq 0 \\ x - 1 & \text{if } 0 \leq x \leq 2 \\ 1 & \text{if } 2 \leq x \end{cases}$$

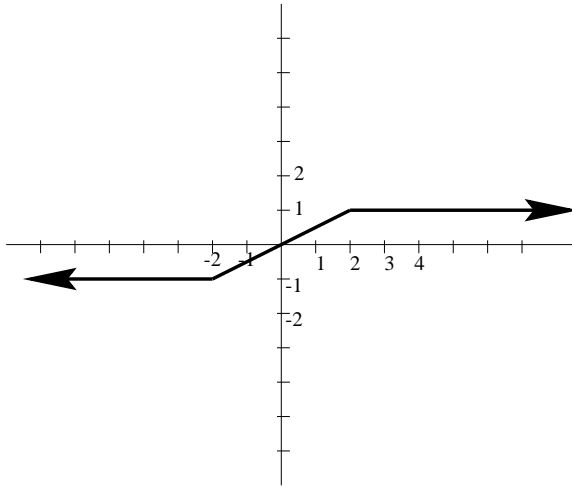
(a) (3pts) Sketch the graph of $f(x)$.



(b) (6pts) Find the multipart rule for $y = f(\frac{1}{2}(x + 2))$ and sketch the graph.

Operations are: first horizontal expand by factor of 2, then horiz shift left 2 units. Here is the resulting picture of the graph and the multipart rule.

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



(c) (5pts) Find the multipart rule for $y = 2f(\frac{1}{2}(x + 2)) + 2$ and sketch the graph.

Operations are: first horizontal expand by factor of 2, then horiz shift left 2 units, then vertical expand by factor of 2, then vertical shift up 2 units. Here is the resulting picture of the graph and the multipart rule.

$$2f(\frac{1}{2}(x + 2)) + 2 = \begin{cases} 0 & \text{if } x \leq -2 \\ x + 2 & \text{if } -2 \leq x \leq 2 \\ 4 & \text{if } 2 \leq x \end{cases}$$

