

10. [9 points] Suppose data is collected at a U-M basketball game held at Crisler Center. Let  $E(t)$  be the total amount of electricity, in megawatt-hours (MWh), that has been used by Crisler Center during the first  $t$  minutes of the basketball game, which starts at exactly 7:00 pm. Assume that  $E$  is invertible and that both  $E$  and  $E^{-1}$  are differentiable.

- a. [3 points] Suppose  $b$  and  $c$  are positive constants. Use a complete sentence to give a practical interpretation of the equation

$$E(30 + b) = E(30) + c$$

in the context of this problem. Your sentence should involve the constants  $b$  and  $c$  but not “ $E$ ”. Be sure to include units.

*Solution:* In the  $b$  minutes after 7:30 pm, Crisler Center uses  $c$  MWh of electricity.

- b. [3 points] Fill in the two answer blanks below to write a single mathematical equality involving the derivative of either  $E$  or  $E^{-1}$  which supports the following claim:

“During the basketball game, Crisler Center uses about 1.8 MWh of electricity during the first 3 seconds after 7:45 pm.”

**Answer:**            $E'(45)$            =           36          

- c. [3 points] Which of the sentences below best expresses the meaning of the equation

$$E^{-1}(20) = 1.5E^{-1}(12)$$

in the context of this problem? (Circle the one best choice.)

- A. Crisler Center uses 50% more electricity during the first 20 minutes after the game starts than during the first 12 minutes after the game starts.
- B. It takes half as long for Crisler Center to use the first 12 MWh of electricity during the game than for it to use the next 8 MWh.
- C. Crisler Center uses 50% as much electricity during the first 20 minutes after the game starts than during the first 12 minutes after the game starts.
- D. It takes 50% longer for Crisler Center to have used a total of 20 MWh of electricity during the game than for it to use the first 12 MWh.
- E. Crisler Center uses twice as much electricity during the first 20 minutes after the game starts than during the next 12 minutes.
- F. It takes 50% less time for Crisler Center to have used a total of 12 MWh of electricity during the game than for it to use the first 20 MWh.