

7. [11 points] Falco decides to raise sheep and cows on his farm.
- Let $W(p)$ be the amount of wool, in pounds per year, produced by a sheep who was fed p pounds of food per day.
 - Let $M(p)$ be the amount of milk, in thousands of gallons per year, produced by a cow who was fed p pounds of food per day.

The functions $W(p)$ and $M(p)$ are differentiable and invertible.

- a. [2 points] Use a complete sentence to give a practical interpretation of the the equation

$$W^{-1}(28) = 10.$$

Solution: A sheep fed 10 pounds of food per day produced 28 pounds of wool per year.

- b. [3 points] Write a single equation representing the following statement in terms of the functions W , M , and/or their inverses:

A sheep that produced 12 pounds of wool per year was fed 5 fewer pounds of food per day than a cow that produced 2430 gallons of milk per year.

Answer: $M^{-1}(2.43) = W^{-1}(12) + 5$

- c. [3 points] Complete the following sentence to give a practical interpretation of the equation

$$M'(23) = 0.15.$$

If Falco feeds a cow 22.4 pounds of food per day instead of 23 pounds of food per day, then ...

Solution: ...the cow will produce approximately 90 fewer gallons of milk per year.

- d. [3 points] Circle the one sentence that gives a valid interpretation of the equation

$$(W^{-1})'(12) = 0.7.$$

- (i) To increase a sheep's wool production from 12 pounds per year to 12.6 pounds per year, Falco should feed it about 0.42 extra pounds of food per day.
- ii. To increase a sheep's wool production from 12 pounds per year to 12.1 pounds per year, Falco should feed it approximately 0.7 more pounds of food per day.
- iii. A sheep that is fed 12.3 pounds of food per day instead of 12 pounds of food per day will produce approximately 0.21 additional pounds of wool per year.
- iv. When a sheep produces 12 pounds of wool per year, feeding it an extra pound of food per day will cause it to produce about 0.7 additional pounds of wool per year.