**3**. [8 points] Jaime is on a long car trip. Consider the following functions:

- Let $d(t)$ be the distance, in miles, Jaime has driven $t$ minutes after they begin their trip.
- Let $g(t)$ be the amount of gas, in gallons, in Jaime's car's gas tank $t$ minutes after they begin their trip.

Assume that both functions have inverses. For each part below, write a phrase or sentence giving a practical interpretation of the given expression or equation, or explain why it doesn't make sense in this context.

**a.** $d(9) = 4$

*Solution:* When Jaime has driven for 9 minutes, they've gone 4 miles.

**b.** $g(d^{-1}(120))$

*Solution:* the amount of gas, in gallons, in Jaime's car's tank when they've driven 120 miles

**c.** $g(60) = g(0) - 2$

*Solution:* 60 minutes into their trip, Jaime's car has 2 fewer gallons of gas than when their trip started.

**4**. [15 points] Mei is starting a coffee roasting business.

**a**. [4 points] Mei puts green coffee beans into her roaster. Let $T(t)$ be the temperature, in degrees Fahrenheit (°F), inside the roaster $t$ minutes after she starts roasting the beans. Some values of $T(t)$ are given in the table below.

| $t$ | 0 | 3 | 5 | 12 |
|---|---|---|---|---|
| $T(t)$ | 70 | 370 | 470 | 320 |

Compute the average rate of change of $T(t)$ over the interval $[0, 5]$. **Include units.**

*Solution:* $\dfrac{470 - 70}{5 - 0} = \dfrac{400}{5} = 80$

**Answer:** **80°F per minute**

Could $T(t)$ be concave down on the entire interval $[0, 12]$? Show your work, and circle your final answer.

*Solution:* The average rates of change over the three consecutive subintervals are $\dfrac{370 - 70}{3 - 0} = 100$, $\dfrac{470 - 370}{5 - 3} = 50$, and $\dfrac{320 - 470}{12 - 5} < 0$. Since these are decreasing, yes, the function could be concave down on this interval.

**Answer** (*circle one*): **Yes** **No**

*This problem continues onto the following page.*