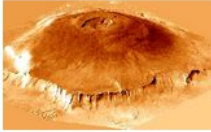


Math 61 Learning Unit 2 Hand-In Assignment for Section 3.5

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1. **Temperatures on Mars** The air temperature one chilly spring morning at your time-share condominium at the base of Olympus Mons, t hours after 6:00 am, was given by the function $f(t) = -5t^2 + 50t - 80$ degrees Fahrenheit ($0 \leq t \leq 4$).[†] What was the temperature at 7:00 am and how fast was it rising? (Use the method of [Example 1\(a\)](#).)

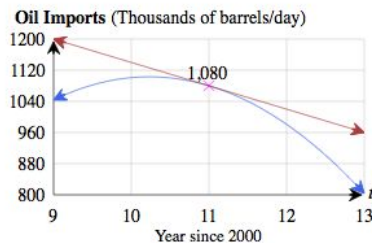


Olympus Mons

[†] The average temperature on Mars is around -80°F but can get considerably warmer near the equator.

Hint: Use a balanced difference quotient. See Section 3.5 Exercise 85 for a similar problem in the book.

2. **Oil Imports from Mexico** The following graph shows approximate daily oil imports to the United States from Mexico.* Also shown is the tangent line at the point corresponding to year 2011.



- a. Estimate the slope of the tangent line shown on the graph. What does the graph tell you about oil imports from Mexico in 2011? [HINT Identify two points on the tangent line. Then see the [Quick Example of Secant and Tangent Lines](#).]
b. According to the graph, is the rate of change of oil imports from Mexico increasing, decreasing, or increasing then decreasing? Why?

* Model based on data from the Department of Energy. Source for data: U.S. Energy Information Administration <http://www.eia.gov>.

‡ 1980 data estimated. Source: <http://www.sciencewatch.com>

Hint: Similar to Section 3.5 Exercise 79 in the book.

3. **The 2014 Ebola Outbreak** In the first six months of the 2014 Ebola outbreak, the total number of reported cases could be approximated by

$$C(t) = 95.9e^{0.72t} \quad (0 \leq t \leq 6),$$

where t is time in months since April 1, 2014.‡ Estimate $C(5)$ and $\left.\frac{dC}{dt}\right|_{t=5}$ and interpret your answers.

‡ Exponential model is the authors' Source for data: Wikipedia/Centers for Disease Control and Prevention/WHO

Hint: Similar to Section 3.5 Exercise 87 in the book.

4. Subprime Mortgage Debt during the Housing Crisis (Compare [Exercise 30 of Section 3.4.](#)) The value of subprime (normally classified as risky) mortgage debt outstanding in the United States during the period 2000–2009 can be approximated by

$$A(t) = \frac{1,350}{1 + 4.2(1.7)^{-t}} \text{ billion dollars } (0 \leq t \leq 9),$$

where t is the number of years since the start of 2000. ¶

a. Estimate $A(7)$ and $A'(7)$. (Round answers to two significant digits.) What do the answers tell you about subprime mortgages?

T b. Graph the function and its derivative and use your graphs to estimate when, to the nearest year, $A'(t)$ is greatest. What does this tell you about subprime mortgages? [HINT See [Example 5\(a\).](#)]

¶ Source: Data 360 <http://www.data360.org>

Hint: This is [Section 3.5 Exercise 96](#), similar to [Exercise 95](#) in the book.

5. Sketch the graph of a function whose derivative decreases from 0 to -1 and then increases back to 0.

6. If two functions have the same derivative at every point, how do their graphs compare?