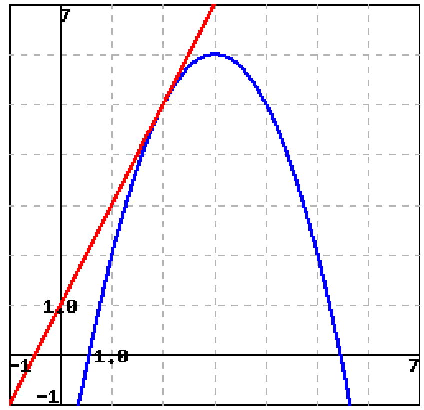
Chapter 2 Review



1. **(Lesson 2.1)** The image shows the graph of $y = f(x)$.
   (a) An estimate of $f(2)$ is _____.
   (b) An estimate of $f'(2)$ is _____.
   (c) Find the point-slope form of the tangent line at $x = 2$.
   (d) Find the slope-intercept form of the tangent line at $x = 2$.
   (e) **(Lesson 2.5)** Use the tangent line to approximate $f(2.2)$.

2. **(Lesson 2.1)** Find the derivative of each quadratic function.
   (a) If $f(x) = ax^2 + bx + c$, then $f'(x) =$ _____ .
   (b) If $g(t) = -9t^2 + 3t + 41$, then $g'(t) =$ _____ .
   (Lesson 2.3) Find the derivative of each cubic function.
   (c) If $f(x) = ax^3 + bx^2 + cx + d$, then $f'(x) =$ _____ .
   (d) If $h(w) = -5w^3 - 21w^2 + 2w + 1$, then $h'(w) =$ _____ .

3. **(Lesson 2.2)** The profit in thousands of dollars for a computer company is given by the function $P(x) = -x^2 + 12x - 10$, where x is thousands of units produced. (For example, $P(2) = 10$ means that the profit is 10 thousand dollars when 2 thousand units are produced.)
   (a) Determine how many thousands of units must be produced to yield maximum profit.
   (b) Determine the maximum profit.

4. **(Lesson 2.3)**
   (a) Write down the limit definition of the derivative function of *f*.
   (b) Use the definition of the derivative to compute the derivative of $f(x) = 8x^2 - 5$. Check your answer by using the derivative formula for a quadratic.

5. **(Lesson 2.4)** Suppose that a vehicle travels north and south according to the equation $s(t) = 2t^3 - 12t^2 - 1$, where s is miles and t is hours. Assume that north is positive and south is negative. Also assume that time t can be any real number, including negative ones.
   (a) Compute the velocity function v and the acceleration function a, find their zeros, and perform number-line sign tests.
   (b) List all the times at which the vehicle is at rest.
   (c) Use interval notation to indicate when the vehicle is traveling north (i.e., when s is increasing.)
   (d) Use interval notation to indicate when the vehicle is traveling south (i.e., when s is decreasing.)
   (e) Use interval notation to indicate when the acceleration of the vehicle is positive (i.e., when s is concave up.)

(f) Use interval notation to indicate when the acceleration of the vehicle is negative (i.e., when s is concave down.)

(g) Use interval notation to indicate when the vehicle is speeding up (i.e., when v and a have the same sign.)

6. **(Lesson 2.5)** The edge of a cube was measured as 15 cm with a possible error in measurement of ±0.12 cm.
   (a) Estimate the propagated and relative errors in the calculated volume of the cube.
   (b) Estimate the propagated and relative errors in the calculated surface area of the cube.

7. **(Lesson 2.6)** Evaluate the following indefinite integrals:

   (a) $\int m\,dx =$ _____ (d) $\int 4.3\,dx =$ _____

   (b) $\int (ax+b)\,dx =$ _____ (e) $\int (4t-7)\,dt =$ _____

   (c) $\int (ax^2+bx+c)\,dx =$ _____ (f) $\int (-8.1v^2+1.6v+2.2)\,dv =$ _____

8. **(Lesson 2.6)** Evaluate the following definite integrals using the Fundamental Theorem of Calculus:

   (a) $\int_2^7 (-3x+4)\,dx =$ _____

   (b) $\int_{-6}^{-2} (-6.81u-2.3)\,du =$ _____

9. **(Lesson 2.6)** A stone is thrown straight up from the edge of a roof, 120 meters above the ground, at a speed of 13 m/s. Recall that the acceleration due to gravity is –9.81 m/s^2. All answers require units.
   (a) Find the equation for the object's velocity using the relationship $v = \int(-9.81)dt$, remembering that the initial velocity is 13 meters per second.
   (b) Find the equation for the object's position using the relationship $s = \int v\,dt$, remembering that the initial position is 120 meters.
   (c) At what time does the stone hit the ground?
   (d) What is the velocity of the stone when it hits the ground?

10. **(Lesson 2.6)** Consider the definite integral $\int_1^{3.4} 2x^3\,dx$. Estimate the integral using left-hand and right-hand approximations using 4 subintervals of width $\Delta x =$ _____:

    $L_4 =$ (__________ + __________ + __________ + __________) · __________ = __________

$R_4 =$ (__________ + __________ + __________ + __________) · __________ = __________