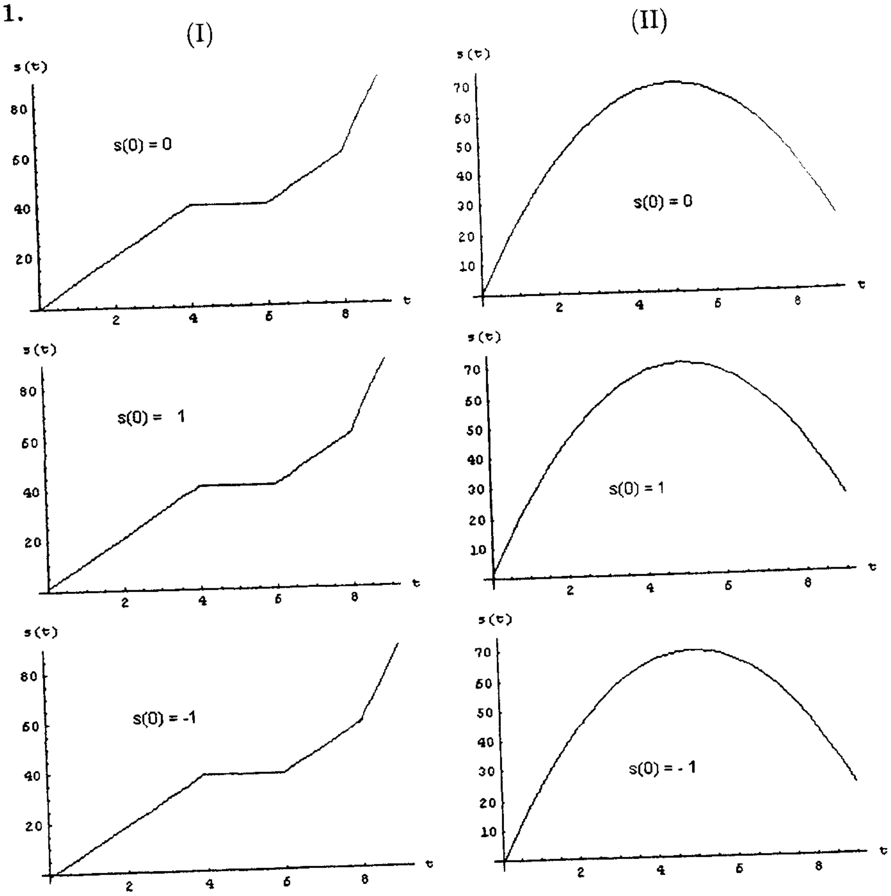
Section 5.3 Qualitative Interpretation of the Derivative

Problem 3.

(a) E; (b) B; (c) A; (d) G; (e) H; (f) F; (g) C; (h) D

Problem 11.



Section 5.4 Interpreting the Derivative: Meaning and Notation

Problem 1.

(a), (c), (d), (f), (g).

Problem 5.

(a) $\frac{dB}{da}$ is the instantaneous rate of change of the length of the drive with respect to change in altitude; $\frac{dB}{da} = \frac{\Delta B}{\Delta a}$ as $\Delta a \to 0$. Its units are feet/feet (change in distance / change in altitude).

(b) $\frac{dB}{da} = \frac{2}{275}$ ft/ft. The slope is constant because $B(a)$ is linear.

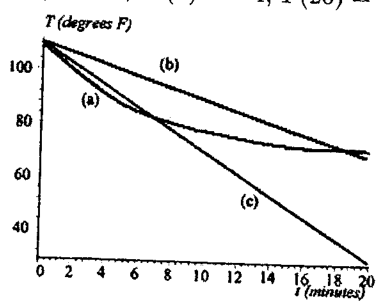
(c) $B(a) = mx + b$. We know $m = \frac{2}{275}$ from above. We know that $B(0) = 400$ from the problem, so $m(0) + b = 400$, and $b = 400$. $B(a) = \frac{2}{275}x + 400$.

(d) $B(1050) = \frac{2}{275}(1050) + 400 \approx 407.8$ ft.

(e) $B(5280) = \frac{2}{275}(5280) + 400 \approx 438.4$ ft.

Problem 8.

(a) $T(0) = 110$; $T'(0) = -4$; $T(20) = 70$.



(b) Under the linear model, $T(15) = 50$. In reality, $T(15)$ is larger than that.

(c) Under this linear model, $T(15) = 80$. In reality, $T(15)$ is smaller than that.

Problem 9.

(a) After four hours into the trip, the balloon is rising at a rate of 70 feet per hour.

(b) (i) The input of h is x, the balloon's horizontal distance from the mouth of the river. The output of h is the balloon's height above the ground.

(ii) When the balloon is 700 feet from the mouth of the river, it is 100 feet above the ground

(iii) When the balloon is 700 feet from the mouth of the river, it is rising at a rate of 60 feet per additional foot traveled up the river bank.

Section 6.1 A Profile of Quadratics from a Calculus Perspective

Problem 1.

f': (i); g': (iv); h': (ii); j': (iii)

Problem 3.

$y' = -2\sqrt{3}x + \sqrt{27} = \sqrt{3}(-2x+3)$; $0 = y' = \sqrt{3}(-2x+3) \Rightarrow x = \frac{3}{2}$ and $y\left(\frac{3}{2}\right) = -\sqrt{3}\left(\frac{3}{2}\right)^2 + \sqrt{27}\left(\frac{3}{2}\right) + 15 = \frac{9}{4}\sqrt{3} + 15$. As the coefficient of x^2 is negative, the vertex $\left(\frac{3}{2}, \frac{9}{4}\sqrt{3} + 15\right)$ is the highest point on the curve.

Problem 6.

(a) As $f'(x) = 2x$, f is of the form $f(x) = x^2 + c$. (a) $f(0) = 0 \Rightarrow c = 0 \Rightarrow f(x) = x^2$. (b) $f(0) = 2 \Rightarrow c = 2 \Rightarrow f(x) = x^2 + 2$.

(b) As $f'(x) = -2x + 8$, f is of the form $f(x) = -x^2 + 8x + c$. (a) $f(0) = 0 \Rightarrow c = 0 \Rightarrow f(x) = -x^2 + 8x$. (b) $f(0) = 2 \Rightarrow c = 2 \Rightarrow f(x) = -x^2 + 8x + 2$.