1. A curve has equation $y = f(x)$.
   (a) Write an expression for the slope of the secant line through the points $P(3, f(3))$ and $Q(x, f(x))$.
   (b) Write an expression for the slope of the tangent line at P.

2. (a) Find the slope of the tangent line to the parabola $y = 4x - x^2$ at the point $(1, 3)$
   (i) using Definition 1 (ii) using Equation 2
   (b) Find an equation of the tangent line in part (a).

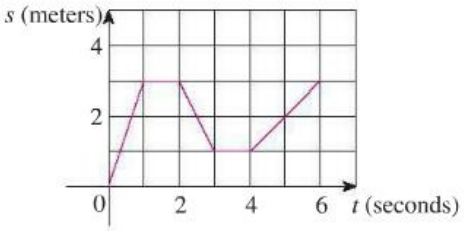
3. (a) Find the slope of the tangent line to the curve $y = x - x^3$ at the point $(1, 0)$
   (i) using Definition 1 (ii) using Equation 2
   (b) Find an equation of the tangent line in part (a).
   (c) Graph the curve and the tangent line in successively smaller viewing rectangles centered at $(1, 0)$ until the curve and the line appear to coincide.

#s 4, 5: Find an equation of the tangent line to the curve at the given point.

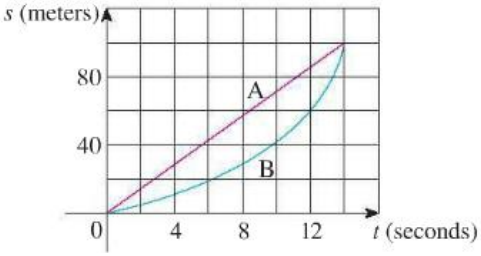
4. $y = \sqrt{x}, \quad (1, 1)$

5. $y = \dfrac{2x + 1}{x + 2}, \quad (1, 1)$

6. (a) A particle starts by moving to the right along a horizontal line; the graph of its position function is shown. When is the particle moving to the right? Moving to the left? Standing still?
   (b) Draw a graph of the velocity function.

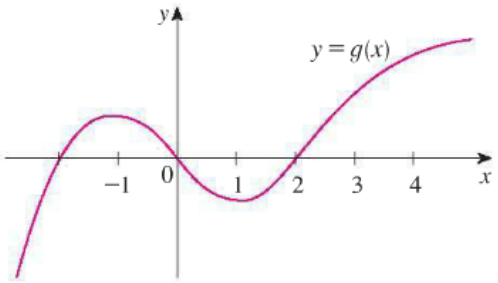


7. Shown are graphs of the position functions of two runners, A and B, who run a 100-m race and finish in a tie.
   (a) Describe and compare how the runners run the race.
   (b) At what time is the distance between the runners the greatest?
   (c) At what time do they have the same velocity?



8. For the function g whose graph is given, arrange the following numbers in increasing order and explain your reasoning:

$0 \quad g'(-2) \quad g'(0) \quad g'(2) \quad g'(4)$



#s 9, 10: Each limit represents the derivative of some function f at some number a. State f and a.

9. $\lim_{h \to 0} \dfrac{(1+h)^{10} - 1}{h}$

10. $\lim_{x \to 5} \dfrac{2^x - 32}{x - 5}$

Bonus: Determine whether $f'(0)$ exists.

B1: $f(x) = \begin{cases} x \sin \dfrac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$

B2: $f(x) = \begin{cases} x^2 \sin \dfrac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$

#18 from the text: Find an equation of the tangent line to the graph of $y = g(x)$ at $x = 5$ if $g(5) = -3$ and $g'(5) = 4$.