1. Find y'.

   (a) $y = \sqrt{\sin^{-1}(2x)}$

   (b) $y = \log_3(x^2 + 5)$

   (c) $y = (\cos x)^x$ (Write your answer in terms of x.)

2. Find the equations for the tangent lines to the following curves at the given points.

(a) $xy^3 + x^3y^2 - 3x = 12$ at the point $(2, -3)$

(b) $y = \dfrac{(x^3 - 7)^5\sqrt{3x^2 + 13}}{x^2 + 1}$ at the point $(2, 1)$

3. A particle moves along the x-axis with position function given by $x(t) = t^3 + 6t^2 - 9$.

   Find the time intervals in which the particle is both moving to the left and slowing down.

4. Find the linearization $L(x)$ of the function $f(x) = \sqrt{25 - x}$ at $a = 9$, and use it to approximate $\sqrt{25 - 10}$.

5. On a dark, still night, Miles Archer, who is six feet tall, walks directly toward his favorite lamppost, which is eleven feet tall. Miles walks at a steady (if deliberate) pace of four feet per second. His shadow silently trails him, getting shorter and shorter as he approaches the lamppost.

   (a) At what rate is Miles's shadow shrinking when he is twelve feet from the lamppost?

   (b) At what rate is the distance between the top of Miles's head and the top of the lamppost changing when Miles is twelve feet from the lamppost?

6. Find the following limits.

(a) $\lim_{x \to 0^-} \dfrac{e^x - 1}{x^2}$

(b) $\lim_{x \to 0^+} (\tan x)^x$

7. Find the absolute maximum and minimum values of the function $f(x) = \dfrac{3x+4}{1+x^2}$ on the interval $[-2, 2]$.