1. Find the derivative of each of the following functions.

(a) $f(x) = \ln\left|3x^2 - 2\right|$

(c) $f(x) = \dfrac{x}{\ln(x)}$

(d) $f(x) = x\ln(x) - x$

(b) $f(x) = \sqrt{\ln\left(\sqrt{x^2 + 2}\right)}$

(e) $f(x) = \ln\left|\sec(x) + \tan(x)\right|$

2. Use logarithmic differentiation to find y' for

(a) $y = \ln\left(\dfrac{(3x-2)^3(x+1)}{\sqrt{1-x^2}}\right)$

(b) $y = \dfrac{\sqrt{x^2-36}\,(x^2-x-6)}{x^2+7x+12}$

3. Show that $f(x) = (x-2)^2 + 5$ is not one-to-one.

4. (a) Prove that $g(x) = \dfrac{3x-2}{x+3}$ is one-to-one.

(b) Find the inverse function for g.

5. Compute the following integrals.

(a) $\displaystyle\int_{-3}^{5} \frac{1}{5x + 63}\, dx$

(d) $\displaystyle\int \left(1 + \sec(x)\right)^2\, dx$

(b) $\displaystyle\int \frac{5x}{x^2 + 4}\, dx$

(e) $\displaystyle\int_{1}^{e^2} \frac{(5 + 6\ln(x))^5}{x}\, dx$

(c) $\displaystyle\int \frac{\ln(x)}{x}\, dx$

(f) $\displaystyle\int \tan(x) + \sin(x)\, dx$

6. (From the 200? AP Calculus AB exam) Let f be the function defined by $f(x) = k\sqrt{x} - \ln(x)$ for $x > 0$, where k is a positive constant.

   (a) Find $f'(x)$ and $f''(x)$.

   (b) For what value of the constant k does f have a critical point at $x = 1$? For this value of k, determine whether f has a relative minimum, relative maximum, or neither at $x = 1$.

   (c) For a certain value of the constant k, the graph of f has a point of inflection on the x-axis. Find this value of k.