$$\tan(x) = \frac{\sin(x)}{\cos(x)} \qquad \csc(x) = \frac{1}{\sin(x)} \qquad \sec(x) = \frac{1}{\cos(x)} \qquad \cot(x) = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)}$$

function	$\sin(x)$	$\cos(x)$	$\tan(x)$	$\csc(x)$	$\sec(x)$	$\cot(x)$
derivative	$\cos(x)$	$-\sin(x)$	$\sec^2(x)$	$-\csc(x)\cot(x)$	$\sec(x)\tan(x)$	$-\csc^2(x)$

1. Give, in your own words, explanations of the following sentences:

   (a) The function f has a critical value at a.

   (b) The function g has a maximum at b.

   (c) The function h has a minimum at c.

   (d) The function k has a root at d.

2. (a) Let $p(z) = 3^{4z}$, and find $p'(z)$ and $p''(z)$.

   (b) Let $q(z) = ab^{cz+d}$, and find $q'(z)$ and $q''(z)$.

   (c) Find a formula for $q^{(n)}(z)$.

3. (a) Find all the maxima and minima of $r(x) = \cos(x)$ on the interval $[-\pi, \pi]$.

   (b) Find all the maxima of $s(x) = \sin(x) + x/2$ on the interval $[-5\pi, -2\pi]$.

4. Let $y = \tan^{-1}(x)$.

   (a) Find $\frac{dy}{dx}$ by implicit differentiation.

   (b) Using the identity $\sec^2(y) - \tan^2(y) = 1$, write $\frac{dy}{dx}$ without trigonometric functions.