1. (a) Find $\left.\dfrac{d\cos x^\circ}{dx}\right|_{x=60}$. (b) Find $\dfrac{dy}{dx}$ for $y = \left[\frac{1}{2}(1-\cos(2t))\right]^4$.

2. Write down the definition for (a) $\lim_{x\to-\infty} f(x) = \infty$, (b) $\lim_{x\to\infty} g(x) = 100$.

3. For $x \in \mathbb{R}$, let $f(x) = x^{6/11}$. Prove that $f'(0)$ does not exist.

4. Prove that the function $\cos x$ is continuous on $\mathbb{R}$.

5. Let g be twice differentiable on $(3, 10)$. Prove that if $g''(x) \neq 0$ for each $x \in (3, 10)$, then g has at most two zeros in $(3, 10)$.

6. Given $\cos(x + 2y) = 0$, use implicit differentiation to obtain dy/dx in terms of x and y and evaluate dy/dx at $(\pi/6, \pi/6)$.

7. Suppose that f is continuous on $[\alpha, \beta]$ and $f(\alpha) = f(\beta)$. Prove that f has at least one critical number in (α, β).

8. Sketch the graph of $f(x) = x + \dfrac{1}{x}$ for $x \in \mathbb{R} \setminus \{0\}$ and find all asymptotes.

9. Let P be a point that is in the first quadrant and on the line $4x + 3y = 12$. Find the coordinates of P that maximize the area of the rectangle with vertices at the origin and P whose sides are parallel to the x and y axes.