1. Consider the function

$$f(x) = \frac{2^x - 8}{\sqrt{x^2 + 1} - \sqrt{10}}.$$

- (a) Numerically compute the left-hand limits, right-hand limits, and limits at -3 and at 3. If any discrepancies occur, identify them and explain why you think they occurred. Make sure that you tell me what the six limits are. Use complete sentences.
- (b) Find the same six limits as above, but do so graphically rather than numerically.
- (c) Find the same six limits as above, but do so symbolically rather than numerically or graphically. If a full limit does exist, evaluate the function at that point.
- (d) Does the function have any horizontal asymptotes? Justify.
- 2. Determine, if possible, the left-hand limit, right-hand limit, and limit for

$$g(x) = \begin{cases} \frac{\tan 4x}{3x} \text{ if } x < 0\\ (1+4x)^{\frac{1}{3x}} \text{ if } x \ge 0 \end{cases}$$

at 0. Evaluate g at 0. Also, determine the limit of the function g as x grows without bound to the left and right.

3. Evaluate each limit, if possible. Use the same variable as given. Note: You should be looking at your answers and making sure that they make sense. If they do not, make sure that you have typed in the functions in a way that Maple understands.

$$\begin{array}{ll} \text{(a)} & \lim_{t \to \infty} \frac{4t-3}{\sqrt{t^2+1}} & \text{(e)} & \lim_{\theta \to \frac{\pi}{2}} \frac{1+\sin\theta}{\cos^2\theta} \\ \text{(b)} & \lim_{t \to -\infty} \frac{4t-3}{\sqrt{t^2+1}} & \text{(f)} & \lim_{x \to 0^+} \left(\frac{1}{\sqrt{x^2+1}} - \frac{1}{x}\right) \\ \text{(c)} & \lim_{\varphi \to 0} (\cot\varphi)^{\tan\varphi} & \text{(g)} & \lim_{t \to 0^-} \left(\frac{1}{t} - \csc t\right) \\ \text{(d)} & \lim_{x \to 0^+} (1+3x)^{\csc x} & \text{(h)} & \lim_{\theta \to \frac{\pi}{2}^-} (\sec^2\theta - \tan^2\theta) \end{array}$$