

- You can take as long as you like to complete this gateway.
- To pass this gateway you must get 4 of the 5 problems *COMPLETELY* correct.
- If your previous gateway was number k , please make sure this is gateway $k + 1$.
- If the first gateway you pass is number n then your score for gateways will be $20 - n$.
- **Circle your final answers; that is what I will grade.**
- **No calculators, books, or notes allowed!!**

1. Find the following limits:

(a) $\lim_{x \rightarrow \frac{\pi}{2}^+} \tan x$

(b) $\lim_{x \rightarrow 0} x \ln x$

2. Find the derivatives of the following functions (don't simplify your answers):

(a) $f(x) = \log_4(1 + 2^x)$

(b) $f(x) = \cos^2 x + \sin^2 x$

(c) $f(x) = \sec(\tan^{-1}(3x + 1))$