

- 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)  $\lim_{x \rightarrow \infty} \frac{e^{2x} - e^{4x}}{e^{3x}}$

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

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

(a)  $f(x) = \frac{\sqrt[4]{x}}{x^{-5} - 3x^2 + \frac{1}{x}}$

(b)  $f(x) = e^{\tan x} \log_5(\sqrt{x})$

(c)  $f(x) = \sin^{-1}(\sec^2(x^3))$