

(1) [3] Evaluate the following limit. If the limit does not exist but is  $\infty$  or  $-\infty$ , state which, with an explanation of your reasoning.

$$\lim_{x \rightarrow 3^+} e^{2/(3-x)}$$

(2) [4] Differentiate:  $y = \ln(e^{-x} + xe^{-x})$

(3) [3] Differentiate:  $y = 2^{\cos(\pi x)}$

(4) [5] Use logarithmic differentiation to find the derivative of  $y = (\tan x)^{1/x}$

(5) [5 bonus points] There are two tangent lines to the curve  $y = x^2 - x$  which pass through the point  $(-2, -3)$ . Determine the points at which these tangent lines contact the curve.