

Math 131 - Homework 5
April 28, 2021

Name key
Score _____

The following problems are from the suggested homework. Show all work to receive full credit. Supply explanations when necessary. This assignment is due May 5.

1. (2 points) Assume $k > 0$ and evaluate the limit: $\lim_{x \rightarrow \infty} \frac{\ln x}{x^k}$ ∞/∞ More work!

$$\lim_{x \rightarrow \infty} \frac{\ln x}{x^k} = \lim_{x \rightarrow \infty} \frac{\frac{1}{x}}{k x^{k-1}} = \lim_{x \rightarrow \infty} \frac{1}{k x^k} = \frac{0}{\infty}$$

2. (2 points) Evaluate the limit: $\lim_{x \rightarrow 0} \frac{e^x - x - 1}{x^2}$ $0/0$ More work!

$$\lim_{x \rightarrow 0} \frac{e^x - x - 1}{x^2} = \lim_{x \rightarrow 0} \frac{e^x - 1}{2x} = \lim_{x \rightarrow 0} \frac{e^x}{2} = \frac{1}{2}$$

Turn over.

3. (4 points) Evaluate each integral.

$$(a) \int \frac{3x^2 + 2}{x^2} dx$$

$$= \int \frac{3x^2}{x^2} + \frac{2}{x^2} dx = \int (3 + 2x^{-2}) dx$$

$$= 3x - 2x^{-1} + C$$

$$(b) \int (e^x + 3x + \sin x) dx$$

$$= e^x + \frac{3}{2}x^2 - \cos x + C$$

4. (2 points) Solve the initial value problem.

$$f'(x) = \cos x + \sec^2 x, \quad f\left(\frac{\pi}{4}\right) = 2 + \frac{\sqrt{2}}{2}$$

$$f(x) = \sin x + \tan x + C$$

$$f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} + 1 + C = 2 + \frac{\sqrt{2}}{2}$$

$$\Rightarrow C = 1$$

$$f(x) = \sin x + \tan x + 1$$