

MATH 110-001 QUIZ 6

November 29, 2017

Time: 15 minutes

Show all your work. No calculators, no books/notes are allowed.

Name (please print): _____

Student number: _____

Solution Key

1. For the following function $f(x)$,

$$f(x) = \frac{1}{1 + \ln(x)}$$

a) Find the domain of $f(x)$. Box your answer.

$$x > 0$$

$$1 + \ln(x) \neq 0$$

$$\ln(x) \neq -1$$

$$x \neq e^{-1} \Rightarrow x \neq \frac{1}{e}$$

$$\therefore \left. \begin{array}{l} x > 0 \\ x \neq \frac{1}{e} \end{array} \right\} \boxed{x \in (0, \frac{1}{e}) \cup (\frac{1}{e}, \infty)}$$

2pt

b) Find the derivative of $f(x)$. Do not simplify and box your answer.

$$f(x) = \frac{1}{1 + \ln x}$$

$$f'(x) = \frac{-\frac{1}{x}}{(1 + \ln x)^2}$$

$$f(x) = (1 + \ln x)^{-1}$$

$$f'(x) = -\frac{1}{(1 + \ln x)^2} \cdot \frac{1}{x}$$

$$= -(1 + \ln x)^{-2} \cdot \frac{1}{x}$$

both are fine

2pt

2. The percentage of a population, $P(t)$, who have heard a rumor by time t , can be modeled by

$$P(t) = \frac{100}{1 + Ae^{-\frac{t}{2}}}$$

where A is a positive constant.

- a) Initially what percentage of the population have heard the rumor? You should have A in your answer.

$$P(0) = \frac{100}{1+A} \quad (\text{"initially"} = t=0)$$

2pt

- b) How fast is the rumor spreading?

$$\hookrightarrow P'(t) = \frac{100 \left(-\frac{A}{2} e^{-\frac{t}{2}}\right)}{\left(1 + Ae^{-\frac{t}{2}}\right)^2}$$

$$\text{or } P'(t) = -\left(1 + Ae^{-\frac{t}{2}}\right)^{-2} \cdot 100 \cdot \left(-\frac{A}{2} e^{-\frac{t}{2}}\right) \\ = -100 \left(1 + Ae^{-\frac{t}{2}}\right)^{-2} \left(-\frac{A}{2} e^{-\frac{t}{2}}\right)$$

both are fine

2pt

Bonus: Write down what you like and dislike about this course. Anything you write that **MAKES SENSE** will replace the lowest of question (1) or (2) above with 100%.

IDK, something like "David is the best prof"? LOL ☺