APPM 1345

Exam 3

Spring 2023

Name	
Instructor Richard McNamara	**Section** 150

1. (23 pts) Parts (a) and (b) are unrelated.

   (a) Find the inverse function of $g(x) = 6x^5 \quad 1$.

      Solution:

      $y = g(x) = 6x^5 \quad 1$

      $6x^5 = y + 1$

      $x^5 = \dfrac{y + 1}{}$

2. (27 pts) Parts (a), (b) and (c) are unrelated.

(a) Suppose $1=3$ of a radioactive substance remains after decaying exponentially for 10 years. Find the half-life of the substance, including the correct unit of measurement. Fully support your answer.

Solution:

Since the substance is undergoing exponential decay, the amount of the substance at time t years can be represented by $y(t) = y_0 e^{kt}$, where $y_0 = y(0)$ is the amount of the substance at time $t = 0$ and k is the relative rate of change. Therefore, for $t = 10$, we have the following:

$$y(10) = y_0 e^{10k} = \frac{y_0}{3} \quad) \quad 10k = \ln \frac{1}{3} \quad) \quad k =$$

3. (24 pts) Evaluate the following derivatives using properties of logarithms and/or logarithmic differentiation. Do **not** fully simplify your answers, although they must be expressed as functions of x.

(a) $\dfrac{d}{}$

4. (26 pts) Evaluate the following integrals. Fully simplify your answers.

(a) $$\int_4^9 \frac{dx}{\sqrt{x}(1-2\sqrt{x})}$$

Solution:

Let $u = 1 - 2\sqrt{x} = 1 - 2x^{1-2}$, which implies that $du = -x^{-1-2}\,dx = -\frac{dx}{\sqrt{x}}$.

$x = 4 \quad) \quad u = 1 - 2\sqrt{4} = -3$

$x = 9 \quad) \quad u = 1 - 2\sqrt{9} = -5$

$$\int_4^9 \frac{dx}{\sqrt{x}(1-2\sqrt{x})} = \int_{-3}^{-5} -\frac{du}{u} = \int_{-5}^{-3} \frac{du}{u} = \ln|u|\Big|_{-5}^{-3} = \ln$$

ADDITIONAL BLANK SPACE
If you write a solution here, please clearly indicate the problem number.