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

(b) Consider the function $f(x) = 2x^5 + x^3 + 3x + 2$.

    i. Explain why f is invertible, based on its derivative.

   ii. Find an equation of the line that is tangent to the curve $y = f^{-1}(x)$ at the point $(8, 1)$.

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.

(b) Identify all critical numbers of the function $h(x) = x^2\, 3^x$, if any.

(c) Rewrite the expression $e^{(5 \ln 2)\, t}$ so that it includes no logarithmic terms.

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) $\dfrac{d}{dx} \left[\ln \left(\dfrac{(x-2)^{3/2} (\cos x + 2)}{\sqrt{x^2 + 4}} \right) \right]$, $\quad x > 2$

(b) $\dfrac{d}{dx} (x^6 + 1)^{\sin x}$

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

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

(b) $\displaystyle\int \cot x \, dx$

END OF TEST

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