# Test 3A, Math 152

**Name:** _____

**PID Number:** _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

_____

(*signature*)

## DIRECTIONS

1. Show all of your work. A correct answer with insufficient work will be counted wrong.
2. Clearly indicate your answer by putting a box around it.
3. Calculators are allowed on this exam, but NOT cell phones or laptops.
4. Give all answers in exact form, not decimal form (that is, put $\pi$ instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated. Simplify all fractions to lowest terms.
5. Make sure you sign the pledge and write your PID on both pages.
6. Number of questions = 9. Total points = 100.

**PID Number:** _____

1. (4 points) Answer true or false. Briefly explain your answer.
   (a) $-\ln(5) = \ln(\frac{1}{5})$

   (b) For positive $x$ and $y$, $\log(xy) = \log(x) \cdot \log(y)$

2. (5 points) Find, if possible, the following limit. Your answer should be a number, $\infty$, or $-\infty$. Explain how you got your answer.
   $\lim_{t \to \infty} \frac{15}{6 + 5e^{-2t}}$

3. (16 points) Find the indicated indefinite integrals. Circle your final answer:

(a) $\int \left( \frac{11t^3 - 15\sqrt{t}}{t^4} \right) dt$

(b) $\int \left( e^{6t} + 5e + \frac{4}{t^2} \right) dt$

4. (8 points) Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = x^{4x}$

5. (10 points) Phosphorus 32 (P-32) has a half-life of 14.2 days. If 100 g of this substance are present initially, find:

   (a) The amount present after $t$ days.

   (b) The amount left after 8 days.

6. (25 points) Find the following derivatives. Circle your final answer.

(a) Simplify your answer. $f(x) = \dfrac{4x}{e^{5x}}$

(b) You do not need to simplify your answer beyond reducing fractions to lowest terms.

$$g(x) = 12\sqrt{x} \cdot \ln(5x^3 - 6)$$

(c) Simplify your answer. $h(x) = \left(10 - e^{5x^3}\right)^2$

7. (10 points) Find the indicated indefinite integral. Circle your final answer.

$$\int \ln(x^4+5)\frac{4x^3}{x^4+5}dx$$

8. (10 points) Evaluate the following definite integral:

$$\int_3^5 \frac{6}{x^2}dx$$

9. (12 points) Solve the following equations:

(a) $(e^x)^3 = e^{8x} \cdot e^6$

(b) $21 = 6 + \ln(2x + 7)^5$

Extra Credit: (2 points) Draw a diagram that represents an approximation for the area under the curve $f(x)$ on the interval $[a, b]$. Use 4 equal subintervals and pick the right endpoint to be the representative point.