

## CALCULUS OF INVERSE FUNCTIONS

BLAKE FARMAN

*Lafayette College*

Name: \_\_\_\_\_

1. Find the limit:  $\lim_{x \rightarrow \infty} 3^x$

2. Find the limit:  $\lim_{x \rightarrow -\infty} \left(\frac{1}{3}\right)^x$

3. Find  $\frac{dy}{dx}$ . Assume  $y$  is a differentiable function of  $x$ .

$$3y = xe^{5y}$$

For problems 4-10, find  $f'(x)$ .

4.  $f(x) = e^x \sin x$

5.  $f(x) = \ln(xe^{7x})$

6.  $f(x) = \frac{x}{\sqrt{1 - \ln(x)^2}}$

7.  $f(x) = (xe^x)^\pi$

8.  $f(x) = (e^{2x} + e)^{\frac{1}{2}}$

9.  $f(x) = (\ln(5x^2 + 9))^3$

10.  $f(x) = \ln((5x^2 + 9)^3)$

For problems 11-20, find the indefinite integral (you may need  $u$ -substitution).

11.  $\int e^x dx$

12.  $\int a^x dx$ , where  $a > 0$  is a constant ( $\neq 1$ ).

13.  $\int \pi^{2x} dx$

14.  $\int \frac{1}{x} dx$

15.  $\int e^{2x} dx$

16.  $\int \frac{\ln x}{x} dx$

$$17. \int \frac{\sqrt{\ln(x)}}{x} dx$$

$$18. \int \frac{e^x}{\sqrt{1-e^x}} dx$$

$$19. \int \frac{\ln(e^{2x})}{x^2} dx$$

20.  $\int \frac{e^x}{3 + e^x} dx$

21. Evaluate the definite integral:  $\int_2^3 \frac{xe^{x^2}}{3} dx$