

## MATH 211: 9-20 WORKSHEET

Use the definition of  $\ln(x)$  and  $\exp(x)$  based on integrating for the following.

- (1) Show that  $\ln(1) = 0$ .
- (2) Show that  $a \ln x = \ln(x^a)$  when  $x > 0$ . [Hint: if you can show they have the same derivatives, that means they differ by a constant  $C$ . Can you find out what  $C$  has to be?]
- (3) Show that  $\ln(ab) = \ln a + \ln b$ , when  $a, b > 0$ . [Hint: break up the integral from 1 to  $ab$  to two integrals: from 1 to  $a$  and from  $a$  to  $ab$ . What substitution do you need to do on the second integral to move the limits to 1 to  $b$ ?]
- (4) Use the rules for logs and the fact that  $\ln(x)$  and  $\exp(x)$  are inverses to show that  $\exp(a + b) = \exp(a) \cdot \exp(b)$ .