172 Homework on Logs Name: ______________________________

1. Define $\log(x)$
2. Define 2^x
3. Define $x^{\frac{1}{x}}$
4. Define $(1-2x)^{\frac{1}{x}}$
5. Define $(\sin(x))^x$
6. Define $x^{\sin(x)}$

1. Using the definitions above, find the derivatives of each of them.
2. Prove that $e^{x-y} = \frac{e^x}{e^y}$ by using the fact that e^x is the inverse of the log. Start with $a = e^x \iff \log(a) = x, b = e^y \iff y = \log(b)$
3. Using the above and the definition for b^x prove that $b^{x-y} = \frac{b^x}{b^y}$
4. Use the definition for 2^x to prove that $2^{-1} = \frac{1}{2}$ Hint: you will need to use the property of the log that states $-\log(x) = \log(\frac{1}{x})$

   Find the following limits
5. $\lim_{x\to 0} (1-2x)^{\frac{1}{x}}$
6. $\lim_{x\to\infty} x^{\frac{1}{x}}$
7. $\lim_{x\to 1^+} x^{\frac{1}{1-x}}$
8. $\lim_{x\to\infty} x^{\frac{1\log(2)}{1-\log(x)}}$