Name: _____   Date: _____
AP Calc AB: Derivatives of a^x and $\log_a x$ Ms. Loughran

Do Now:
1. If $f(x) = \ln|x|$, find $f'(x)$.

Derivative of a^x
If $a > 0$ and $a \neq 1$ we can use the properties of logarithms to write a^x in terms of e^x:

$$a^x =$$

We can then find the derivative of a^x with the Chain Rule

$$\frac{d}{dx}(a^u) =$$

Derivative of $\log_a x$
To find the derivative of $\log_a x$ for an arbitrary base $(a > 0, \ a \neq 1)$ we use the change of base formula for logarithms to express $\log_a x$ in terms of natural logarithms:

$$\log_a x =$$

$$\frac{d}{dx}\log_a u =$$

For each of the following find $\dfrac{dy}{dx}$.

1. $y = 4^x$

2. $y = \log_5 \sqrt{x}$

3. $y = 3^{6x}$

4. $y = 5^{\cos x}$

5. $y = \log_3(1 + x\ln 3)$

6. $y = 2^{\sin x}$

7. $y = \ln 2 \cdot \log_2 x$

8. $y = \log_{10} e^x$

9. $y = 3^{\cot x}$

10. $y = 9^{-x}$

11. $y = e^{x^2}$

12. $y = \log_a a^{\sin x}$