Log/Exponent Properties:

$a^{\log_a x} = x$ and $\log_a a^x = x$

ln(1) = 0

ln(e) = 1

$\ln(a^n) = n*\ln(a)$

$\ln(ab) = \ln(a) + \ln(b)$

$\ln\left(\frac{a}{b}\right) = \ln a - \ln b$

$\log_a x = \frac{\ln x}{\ln a}$

Interest Formulas

$A = P\left(1 + \frac{r}{n}\right)^{(nt)}$

$A = Pe^{rt}$

Exponent Properties:

$e^a * e^b = e^{a+b}$

$(e^a)^b = e^{ab}$ $e^0 = 1$

Log Differentiation steps: 1) Take **ln** of both sides 2) Expand right side. 3) Find derivative 4) Solve for dy/dx

Evaluate derivative of inverse: (find $(f^{-1})'(a)$

1.Set f(x) = a and solve for x (guess and check)
2. Find f '(x)
3. Plug in x value from step #1 into f '(x).
4. Flip value.

Log Derivatives:

$\frac{d}{dx}\ln|u| = \frac{u'}{u}$

$\frac{d}{dx}\log_a u = \frac{1}{\ln a} * \frac{u'}{u}$

Exponential Derivatives

$\frac{d}{dx}e^u = e^u * u'$

$\frac{d}{dx}a^u = \ln a * a^u * u'$

Trig Derivatives:

$\frac{d}{dx}\sin u = \cos u * u'$ $\frac{d}{dx}\cos u = -\sin u * u'$

$\frac{d}{dx}\tan u = \sec^2 u * u'$ $\frac{d}{dx}\cot u = -\csc^2 u * u'$

$\frac{d}{dx}\sec u = \sec u \tan u * u'$ $\frac{d}{dx}\csc u = -\csc u \cot u *$

Inverse Trig Derivatives:

$\frac{d}{dx}\arcsin u = \frac{u'}{\sqrt{1-u^2}}$ $\frac{d}{dx}\arccos u = -\frac{u'}{\sqrt{1-u^2}}$

$\frac{d}{dx}\arctan u = \frac{u'}{1+u^2}$ $\frac{d}{dx}arc\cot u = -\frac{u'}{1+u^2}$

$\frac{d}{dx}arc\sec u = \frac{u'}{|u|\sqrt{u^2-1}}$

$\frac{d}{dx}arc\csc u = -\frac{u'}{|u|\sqrt{u^2-1}}$

Integral Formulas:

Power Rule:

$\int u^n\,du = \frac{u^{n+1}}{n+1} + C$

Log Rule:

$\int \frac{1}{u}du = \ln|u| + C$

Exponential Rule: (Base e)

$\int e^u\,du = e^u + C$

Exponential Rule (base other than e)

$\int a^u\,du = \frac{a^u}{\ln a} + C$

Note: lna is a constant

Trig Integrals:

$\int \sin u\,du = -\cos u + C$ $\int \cos u\,du = \sin u + C$

$\int \sec^2 u\,du = \tan u + C$ $\int \sec u \tan u\,du = \sec u + C$

$\int \csc^2 u\,du = -\cot u + C$ $\int \csc u \cot u\,du = -\csc u + C$

$\int \tan u\,du = -\ln|\cos u| + C$

$\int \cot u\,du = \ln|\sin u| + C$

$\int \sec u\,du = \ln|\sec u + \tan u| + C$

$\int \csc u\,du = -\ln|\csc u + \cot u| + C$

Inverse Trig Integrals:

$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a} + C$ $\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a} + C$

$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\text{arcsec}\frac{|u|}{a} + C$

$\int \# / x^2 + \#$ -> arctangent (possible u-sub)

$\int x / x^2 + \#$ -> u-sub (answer will be natural log)

$\int x^2$ or greater $/ x^2 + \#$ -> long division (possible combination probl

$\int \# / x^2 + x + \#$ -> arctangent - complete the square

$\int x / x^2 + x + \#$ -> u-sub (will probably need to split the integral)

$\int x^2$ or greater $/ x^2 + x + \#$ -> long division (possible combo problen