Math 221 - Review for Test #1

- Exponential and Logarithmic functions: definitions, properties, derivative and integration.
  a) Simplify $\log_3 \frac{1}{9}$ b) $y = \log_4(\cos x)$ find y'
- Implicite differentiation; derivatives of inverse functions
  $xe^y = y$
- Logarithmic differentiation: $y = \sqrt{\frac{x-1}{x+1}}$
- Natural growth and decay, half-life.
  $P_0 = 2$ mil, birth rate=20%, death rate=10
- Linear first order differential equations: separation of variables.
  Solve $P' = 20P - 10, P(0) = 10$.
- Applications: population growth, savings account
- Inverse trigonometric functions; derivatives
  Use implicite differentiation to find $\sin^{-1}(x)$
- Indeterminate forms and L'Hopital's rule
  a) Find $\lim_{x\to\infty}(1 + \frac{1}{x})^x$ b) $\lim_{x\to 0} \frac{e^x - 1}{\sin x}$
- Hyperbolic functions and inverse hyperbolic functions
  Use the definition of $\sinh x$ to solve for x in $2 = \sinh x$
- Integration methods: substitutions, trigonometric substitutions and integration by parts. Integrate:
  a) $\int \frac{e^{-\frac{1}{x}}}{x^2}\ dx$ b) $\int \frac{1}{\sqrt{1-x^2}}\ dx$ c) $\int \sin x \cos^2 x\ dx$
  d) $\int \sqrt{x} \ln x\ dx$ e) $\int$ arcsin $x\ dx$ f) $\int x^2 e^x dx$ g) $\int \sin x\ e^x\ dx$