

MATH 122
TEST I

NAME _____

1. (5) State the definition of:

a) natural logarithm: $\ln x =$

b) natural exponential function: e^x

c) other exponential function ($p > 0$): $p^x =$

d) hyperbolic sine: $\sinh x =$

2. Miscellanies about functions

a) (5) True/False

___ i) $\log_5(a + b) = \log_5 a + \log_5 b$

___ ii) $e^{kx} = k e^x$

___ iii) $e^{kx} = k e^{kx}$

___ iv) $\sin^{-1} x = \frac{1}{\sin x}$

___ v) $\ln(a^{-1}) = -\ln a$

b) (5) Fill in the blanks or tell that the expression cannot be rewritten

i) $\ln(xy) =$

ii) $\log_5 a =$

iii) $\frac{\ln a}{\ln b} =$

iv) $\sin(\sin^{-1} 2x) =$

v) $e^{2 \ln x} =$

c) (10) Fill in the table.

	DOMAIN	RANGE	SKETCH
i) $y = \tan^{-1} x$			
ii) $y = \log_5 x$			
iii) $y = \sin^{-1} x$			

5. (10) A bowl is formed by taking the parabola $y = x^2$, $0 \leq x \leq 2$ (feet), and revolving it about the y -axis. It is then filled with a liquid weighing 50 lb/ft. Find the work done in pumping all the liquid out of the top of the bowl.

6. (5@) Derivatives

i) $f(x) = \ln(1 + x^2)$ $f'(x) =$

ii) $g(x) = \tan^{-1}(e^{2x})$ $g'(x) =$

iii) $h(x) = 10^{\sec^{-1}x}$ $h'(x) =$

iv) $k(x) = \cosh(e^{-x^2})$ $k'(x) =$

v) $\phi(x) = \log_6(\sin^{-1}x)$ $\phi'(x) =$

7. (5) Compute the derivative of $y = x^{\sin x}$ ($x > 0$)

8. (10) The count in a bacteria was 400 after 2 hours and 25,600 after 6 hours. Assume the usual exponential growth model. What was the initial population?

9. (5@) Compute integrals

a) $\int \sin^{-1} x \, dx$

b) $\int \frac{2x-1}{x(x^2+4)} dx$

c) $\int (2x - 1) \cosh(3x) \, dx$

d) $\int \frac{dx}{\sqrt{9-4x^2}}$

e) $\int \tanh x \, dx$