

Prob | Pts

Math 121

Calculus II

Spring 2004

Test #3
Instructor: _____

Name: (print neatly) _____
(sign) _____

1

2

3

4

5

1. (**18 pts**) A 200-liter tank initially full of water develops a leak at the bottom. In the first 5 minutes 20% of the water leaks out. The water leaks at a rate proportional to the amount of water in the tank.

- a) What phrase best describes the amount of water in the tank over time.
- i. Exponential Growth iii. Linear Decay
 - ii. Hydrostatic Exposure iv. Exponential Decay

b) Find a function $A(t)$ which gives the amount of water in the tank at time t .

Total

c) How long will it take before the tank contains only 50 liters of water?

2. (12 pts) Evaluate the following:

a) $e^{-2\ln(4)}$

b) $\tan^{-1}(\sqrt{3})$, [i.e., $\arctan(\sqrt{3})$]

c) $\log_2(-8)$

d) $\sin^{-1}(\sin(3\pi/2))$, [Careful...]

3. (10 pts) Solve the following for x :

a) $\ln(x - 4) = 2$

b) $e^{3x-5} = 5$

4. (24 pts) Differentiate the following:

a) $y = e^{-x} + e^{2x-1} - x^{4e} + e^2$

b) $h(t) = 10^{\sqrt{t}}$

c) $y = \tan^{-1}(x^4) = \arctan(x^4)$

d) $f(x) = (3x)^{2x}$

5. (36 pts) Evaluate the following integrals

a) $\int_1^e \frac{\ln(x)}{x} dx$

b) $\int \frac{x}{\sqrt{1-x^2}} dx$

c) $\int \tan(x) dx$

$$\text{d) } \int \frac{e^x}{1 + e^{2x}} dx$$

$$\text{e) } \int_{-1}^1 \frac{dx}{\sqrt{1 - x^2}} dx$$

$$\text{f) } \int_0^\pi x \cos(x) dx$$