Name: _____

Circle your instructor's name:

Broker Hill Joyce Pendharkar

Math 121 Calculus II

Second Test

March 2015

This is a closed-book, closed-notes test. Calculators are not allowed. Please turn off your cellphone and any other electronic equipment during the test.

Leave your answers as expressions such as $e^2\sqrt{\dfrac{\sin^2(\pi/6)}{1+\ln 10}}$ if you like. Show all your work for credit. Be sure that your proofs and computations are easy to read. Points for each problem are in square brackets.

1. [16] Evaluate the following indefinite integral.

$$\int \frac{\sqrt{x^2-4}}{x}\,dx$$

2. [24; 12 points each part] Evaluate the following indefinite integrals.

a. $\int x^2 \sin x \, dx$

b. $\int \cos^3 x \, \sin^2 x \, dx$

3. [12] Evaluate the following definite integral.

$$\int_1^e x \ln x \, dx$$

4. [12] Solve the separable differential equation $\dfrac{dy}{dx} = e^{-y} \cos x$. Your answer should express y as a function of x.

5. [20] Consider the rational function $\dfrac{7x+7}{x^2+3x-10}$.

a. [4] Factor the denominator.

b. [8] Write the rational function as a sum of partial fractions.

c. [8] Use what you found in part **b** to evaluate this integral.

$$\int \frac{7x+7}{x^2+3x-10}\,dx$$

6. [16; 8 points each part] The most common form of radium, radium-226, has a half life of 1601 years.

a. Write down an formula that gives the amount y of radium left after a period of t years when the initial amount is A.

b. Use that formula to determine when only $\frac{1}{3}$ of the initial amount will remain. (Leave your answer in terms of exponents and logs.)

#1.[16]	
#2.[24]	
#3.[12]	
#4.[12]	
#5.[20]	
#6.[16]	
Total	

Some useful formulas

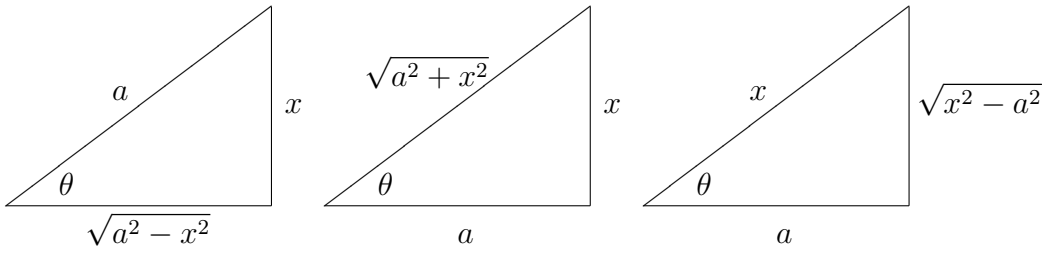
Trig identities

$$\cos^2\theta = \frac{1+\cos 2\theta}{2}$$

$$\sin^2\theta = \frac{1-\cos 2\theta}{2}$$

Trig subs

$x = a\sin\theta$	$x = a\tan\theta$	$x = a\sec\theta$
$dx = a\cos\theta\, d\theta$	$dx = a\sec^2\theta\, d\theta$	$dx = a\sec\theta\tan\theta\, d\theta$
$\sqrt{a^2-x^2} = a\lvert\cos\theta\rvert$	$\sqrt{a^2+x^2} = a\lvert\sec\theta\rvert$	$\sqrt{x^2-a^2} = a\lvert\tan\theta\rvert$



Some useful integrals Most of those on page 431 of the text you should know (especially 1–7). Here are some others

$$\int \sec^2 x\, dx = \tan x + C$$

$$\int \csc^2 x\, dx = -\cot x + C$$

$$\int \sec x\tan x\, dx = \sec x + C$$

$$\int \csc x\cot x\, dx = -\csc x + C$$

$$\int \tan x\, dx = \ln\lvert\sec x\rvert + C$$

$$\int \cot x\, dx = \ln\lvert\sin x\rvert + C$$

$$\int \sec x\, dx = \ln\lvert\sec x + \tan x\rvert + C$$

$$\int \csc x\, dx = -\ln\lvert\csc x + \cot x\rvert + C$$