MATH 141
SPRING 2019
EXAM 2

NAME:

1. 10 pts. each Evaluate the integral by integrating by parts.

   (a) $\displaystyle\int \ln\sqrt{x}\,dx$

   (b) $\displaystyle\int_0^{\pi/3} (\sin x)\ln(\cos x)\,dx$

2. 10 pts. each Evaluate the trigonometric integral.

   (a) $\displaystyle\int \sin^5(6t)\cos^2(6t)\,dt$

   (b) $\displaystyle\int \tan^2\theta\sec^4\theta\,d\theta$

   (c) $\displaystyle\int_0^{\pi/6} \sqrt{1+\cos 2x}\,dx$

3. 10 pts. each Evaluate using trigonometric substitution.

   (a) $\displaystyle\int_0^1 \frac{dx}{(x^2+1)^2}$

   (b) $\displaystyle\int \frac{dt}{t^2\sqrt{t^2-16}}, \qquad t > 4$

4. 10 pts. each Evaluate using partial fractions.

   (a) $\displaystyle\int_1^2 \frac{4y^2-7y-12}{y(y+2)(y-3)}\,dy$

   (b) $\displaystyle\int \frac{x^2-x+6}{x^3+3x}\,dx$

   (c) $\displaystyle\int_0^1 \frac{1}{1+\sqrt[3]{x}}\,dx$ (Make a substitution first)

5. 10 pts. each Evaluate using any strategy.

   (a) $\displaystyle\int e^{x+e^x}\,dx$

   (b) $\displaystyle\int \arctan\sqrt{x}\,dx$

   (c) $\displaystyle\int \sqrt{3-2x-x^2}\,dx$

6. 10 pts. each Determine whether the integral is convergent or divergent, and evaluate if convergent.

(a) $\displaystyle\int_0^\infty \frac{x^2}{\sqrt{1+x^3}}\,dx$

(b) $\displaystyle\int_{-2}^{14} \frac{dx}{\sqrt[4]{x+2}}$

(c) $\displaystyle\int_{-\infty}^{0} ze^{2z}\,dz$

7. 10 pts. Use the Comparison Theorem to determine whether

$$\int_0^1 \frac{\sec^2 x}{x\sqrt{x}}\,dx$$

is convergent or divergent.

Formulas & Definitions

- $(\sin^{-1} x)' = \dfrac{1}{\sqrt{1-x^2}}$
- $(\tan^{-1} x)' = \dfrac{1}{1+x^2}$
- $(\sec^{-1} x)' = \dfrac{1}{|x|\sqrt{x^2-1}}$
- $\displaystyle\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \sin^{-1}\left(\frac{x}{a}\right) + c$
- $\displaystyle\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + c$
- $\displaystyle\int \frac{1}{x\sqrt{x^2-a^2}}\,dx = \frac{1}{a}\sec^{-1}\left|\frac{x}{a}\right| + c$
- $\displaystyle\int \sin^n x\,dx = -\frac{\sin^{n-1} x\cos x}{n} + \frac{n-1}{n}\int \sin^{n-2} x\,dx$
- $\displaystyle\int \cos^n x\,dx = \frac{\cos^{n-1} x\sin x}{n} + \frac{n-1}{n}\int \cos^{n-2} x\,dx$
- $\displaystyle\int \tan^n x\,dx = \frac{\tan^{n-1} x}{n-1} - \int \tan^{n-2} x\,dx$
- $\displaystyle\int \sec^n x\,dx = \frac{\sec^{n-2} x\tan x}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2} x\,dx$
- $\displaystyle\int \tan x\,dx = \ln|\sec x| + c$
- $\displaystyle\int \cot x\,dx = \ln|\sin x| + c$
- $\displaystyle\int \sec x\,dx = \ln|\sec x + \tan x| + c$
- $\displaystyle\int \csc x\,dx = -\ln|\csc x + \cot x| + c$