

Math 142
No Work-No Credit

Exam 2

F06

Name
Last 4 digits

1) Evaluate: $\int x^5 (\ln x) dx$.

$$\int x^5 (\ln x) dx = \frac{x^6 \ln x}{6} - \frac{x^6}{36} + C$$

$$\text{Let } u = \ln x \quad dv = x^5 dx$$

$$du = \frac{1}{x} dx \quad v = \frac{x^6}{6}$$

2) Find the partial fraction decomposition for $\frac{3x^2 + x - 2}{x^3 - 4x}$.

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$$\frac{3x^2 + x - 2}{x(x+2)(x-2)} = \frac{A}{x} + \frac{B}{x+2} + \frac{C}{x-2} \Rightarrow A = \frac{1}{2}, B = 1, C = \frac{3}{2}.$$

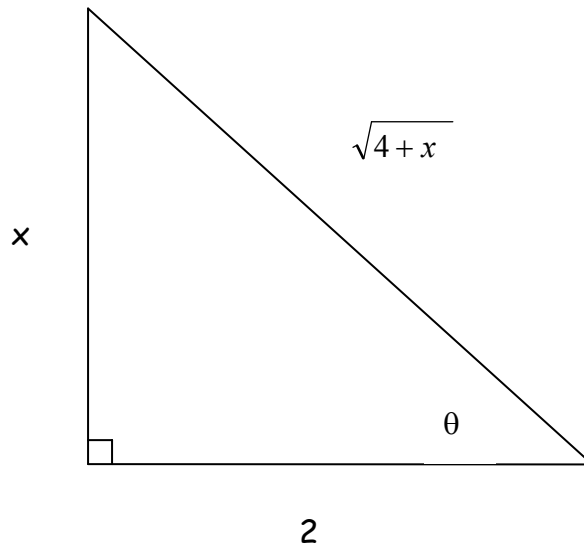
3) Evaluate: $\int \frac{1}{(4+x^2)^{\frac{3}{2}}} dx$

$$\int \frac{1}{(4+x^2)^{\frac{3}{2}}} dx = \frac{1}{4} \int \frac{1}{(1+\tan^2 \theta)^{\frac{3}{2}}} \sec^2 \theta d\theta = \frac{1}{4} \int \frac{1}{\sec^3 \theta} \sec^2 \theta d\theta = \frac{1}{4} \int \cos \theta d\theta =$$

$$\frac{1}{4} \sin \theta + C = \frac{1}{4} \frac{x}{\sqrt{4+x^2}} + C.$$

Let $x = 2 \tan \theta$

$$dx = 2 \sec^2 \theta d\theta$$



4) Compute the value of the integral, or prove it divergent.

$$\int_0^{\frac{\pi}{2}} \sec^2 x \, dx = \lim_{A \rightarrow \frac{\pi}{2}^-} \int_0^A \sec^2 x \, dx = \lim_{A \rightarrow \frac{\pi}{2}^-} \tan x \Big|_0^A = \lim_{A \rightarrow \frac{\pi}{2}^-} (\tan(A) - \tan(0)) =$$

$$= \lim_{A \rightarrow \frac{\pi}{2}^-} \tan(A) = \infty, \text{ so divergent.}$$

5) Use Simpson's Rule to approximate $\int_1^2 \sin(e^x) \, dx$, let $n = 4$.

(Must complete the table for credit.)

i	x_i	$f(x_i)$	M	$Mf(x_i)$
0	1	0.410781290503	1	0.410781290503
1	1.25	-0.34172360956	4	-0.34172360956
2	1.5	-0.973506592772	2	-0.973506592772
3	1.75	-0.504309917978	4	-0.504309917978
4	2	0.893854954913	1	0.893854954913

$$\sum Mf(x_i) = -4.02651105028$$

$$\int_1^2 \sin(e^x) \, dx \approx \left(\frac{0.25}{3} \right) (-4.02651105028) = -0.335542587524$$