

Math 106C
Calculus 2
Exam 2
March 11, 2016
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Please show your work.

1. Evaluate the following:

a) $\int \sin^3(x)\cos^4(x)dx$

b) $\int x^2 \ln(x) dx$

2. Determine if the following integrals converge or diverge. If the integral converges, evaluate the integral.

a) $\int_1^{\infty} \frac{1}{\sqrt[4]{x}} dx$

b) $\int_{-1}^2 \frac{dx}{x^3}$

c) $\int_0^{\pi/2} \sec(\theta) d\theta$

3. Use comparison to show whether the following improper integral converges or diverges. Justify your answer.

$$\int_1^{\infty} \frac{1}{\sqrt{x}(1+x)} dx$$

4. a) Find the 2nd-order Taylor Polynomial for $f(x) = \sqrt{x}$ based at $x_0 = 4$.

b) Use your results from part (a) to estimate $\sqrt{5}$.

5. Taylor's Theorem says that $|f(x) - P_n(x)| \leq \frac{K_{n+1}}{(n+1)!} |x - x_0|^{n+1}$ for all values of x in an interval containing x_0 . Using this result, what is the largest possible error that could have occurred in your estimate of $\sqrt{5}$.

6. Does the following improper integral converge or diverge? Justify your answer. If it converges, evaluate the integral.

$$\int_3^{\infty} \frac{1}{x(x-1)} dx$$

7. Does the following improper integral converge or diverge? Justify your answer. If it converges, evaluate the integral.

$$\int_0^{\infty} x e^{-x} dx$$

8. Evaluate: $\int \frac{dx}{(x^2+1)^{3/2}}$. Note: $(x^2 + 1)^{3/2} = (\sqrt{x^2 + 1})^3$