

Math 112 – Spring 2011
Examination 2

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(14 pts.) Consider the integral $\int_0^\pi x \cos(x) dx$.

a. Evaluate this integral.

b. Estimate this integral using the trapezoid rule with $n = 3$ steps.

2.(14 pts.) Evaluate the following integrals:

a. $\int \tan^3(x) dx$

b. $\int \frac{2x + 1}{x(x - 1)^2} dx$

3.(14 pts.) Evaluate the following integrals if convergent or show divergence.

a. $\int_1^\infty \frac{x^2}{(2x^3 + 1)^{\frac{3}{2}}} dx$

b. $\int_0^8 \frac{1}{(x - 8)^{\frac{2}{3}}} dx$

4.(14 pts.) Evaluate the following integrals:

a. $\int \frac{1}{x^2 \sqrt{25 - x^2}} dx$

b. $\int \frac{\ln(x)}{x^3} dx$

5.(14 pts.) Determine whether the following integrals are convergent or divergent. If you use a convergence or divergence test, please state which test you are using.

a. $\int_1^\infty \frac{\sqrt{x^2 + 1}}{x^3} dx$

b. $\int_\pi^\infty \frac{2 + \sin(2x)}{x} dx$

6.(10 pts.) Evaluate $\int \frac{x^3 + 8}{x^3 + 4x} dx$.

7.(10 pts.) Evaluate $\int \frac{1}{(1 + x^2)^{\frac{5}{2}}} dx$.

8.(10 pts.) Determine whether the following sequences $\{a_n\}$ are convergent or divergent. Find the limit of any convergent sequences.

a. $a_n = \left(\frac{n^3 + 5n^4}{2n^4 + 2n - 1} \right)^{\frac{1}{3}}$

b. $a_n = n \sin\left(\frac{1}{n}\right)$