ADDITIONAL PRACTICES FOR EXAM II

These are problems that most of you took more than two attempts to get correct. Take a closer look now. They are not necessarily labelled which section they belong to. Just treat them as a new problem and see what you can do.

Problem 1. Find the volume of the solid generated by revolving the region bounded above by $y = 2\cos x$ and below by $y = 2\sec x$, $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ about the x-axis.

Problem 2.

$$\int_8^{12} \frac{x^7}{x^4 - 4} dx$$

Problem 3.

$$\int \frac{\theta^3 - \theta^2 + \theta}{\theta - 5} d\theta$$

Problem 4.

$$\int_{1/2}^{2} x \ln(3x)\, dx$$

Problem 5.

$$\int x^3 e^{-3x} dx$$

Problem 6.

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin^4(3x)}{\sqrt{1 - \cos 3x}} dx$$

Problem 7.

$$\int \sqrt{x}\sqrt{9 - x} dx$$

Problem 8.

$$\int \frac{x + 8}{x^3 - 9x} dx$$

Problem 9.

$$\int \frac{3dx}{(x^2 - 1)^2}$$

Problem 10.

$$\int \frac{x^2}{x^4 - 1} dx$$

Problem 11.

$$\int \frac{y^4 + 4y^2 - 1}{y^3 + 4y} dy$$

Problem 12. Estimate the following definite integral with Trapezoidal rule AND Simpson's rule.

$$\int_{-1}^{1} \left(x^2 + 1\right) dx$$

Compare the approximation to the exact answer. Which rule yields less error and why?

Problem 13. Estimate the minimum number of subintervals (n) to approximate the value of

$$\int_{-4}^{7} 8\sin(x + 7)\, dx$$

with an error of magnitude less than 3×10^{-4} using

(1) Trapezoidal Rule.
$$|E_T| \leq \frac{M_T}{12n^2}(b-a)^3$$
where M_T is the maximum value of $f''(x)$.

(2) Simpson's Rule
$$|E_S| \leq \frac{M_S}{180n^4}(b-a)^5$$
where M_S is the maximum value of $f^{(4)}(x)$.

Remark. Identify a, b. Determine f, then M_T, M_S. Set up an inequality and rearrange.

Problem 14. Use Direct Comparison Test (and some manipulations) to determine if
$$\int_1^\infty \frac{\sqrt{x^5+4}}{x^9}dx$$
converges.

Problem 15. Use Direct Comparison Test to determine if
$$\int_{\pi/2}^\infty \frac{1+\cos(2x)}{x^3}dx$$
converges.