PRACTICE FOR FINAL EXAM

Problem 1. Suppose an object has acceleration at time t (in seconds) given by

$$a(t) = 8t - t^2 \text{ (in } m/s^2).$$

Find the net change in velocity of the object between $t = 1$ and $t = 4$.

Problem 2. Compute the antiderivative

$$\int \sec^2(x)\tan(x)dx.$$

Problem 3. Consider the region enclosed by the curves

$$y = x^2 + 2 \text{ and } y = 10 - x^2.$$

Find the volume of the solid of revolution obtained by rotating the region around the x-axis.

Problem 4. Compute the antiderivative

$$\int \frac{\ln(x)}{x^2}dx.$$

Problem 5. $\S11.4$ #20.

Problem 6. Compute the antiderivative

$$\int \cos^{498}(x)\sin^3(x)dx.$$

Problem 7. Compute the antiderivative

$$\int \frac{1}{\sqrt{9 - y^2}}dy.$$

Problem 8. Compute the antiderivative

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

Problem 9. Evaluate the improper integral

$$\int_{-\infty}^{0} e^{-3x}dx.$$

Problem 10. Does the integral

$$\int_1^\infty \frac{\ln(x)}{x^2}\,dx$$

converge or diverge?

Problem 11. Evaluate the series

$$\sum_{n=2}^\infty \left(-\frac{4}{9}\right)^n.$$

Problem 12. Does

$$\sum_{n=1}^\infty \frac{\sqrt{n}}{4n+9}$$

converge or diverge?

Problem 13. Does

$$\sum_{n=2}^\infty \frac{1}{n^{3/2}\ln(n)}$$

converge or diverge?

Problem 14. Does

$$\sum_{n=1}^\infty \frac{(-1)^{n-1}}{n^{1/3}}$$

converge or diverge?

Problem 15. Find the interval of convergence for the power series

$$\sum_{n=0}^\infty \frac{x^n}{n^5}.$$

Problem 16. Find a a power series for the function

$$f(x) = \frac{2x}{1+x^2}.$$

Problem 17. Find the Maclaurin series for the function $g(x) = x^2 e^{x^2}$. Find its radius of convergence.

Problem 18. Find the Maclaurin series for the function $h(x) = \arctan(x^2)$. Find its interval of convergence.