Brief Solutions to the Fall 2006 Math 112 Final Exam

Warning! This practice final is representative of the length and style of a typical final exam. But, there is too much material in this course for a single two hour final to cover it all. Almost surely your final exam will cover material not in this practice exam and vice versa.

1. (a) Converges by the Alternating Series Test $b_n = \sin\left(\frac{\pi}{n}\right)$.
   (b) Diverges by Integral Test using Partial Fractions on $f(x) = \frac{2x+3}{x(x+1)}$.
2. The ratio test gives $R = 3$.
3. $f(x) = \sum_{n=0}^{\infty} 3^{n-1} n x^{n+2}$ and by the ratio test or theorem for derivatives of series: $R = 1/3$.
4. $f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{n!(2n+1)} + C$
5. (a) $I = \frac{x^2}{2} + \frac{1}{2}\ln|x^2+4| + \frac{3}{4}\arctan(x/2) + C$.
   (b) By Integral Table rule 25, $I = \frac{1}{5}\ln|x^5 + \sqrt{x^{10}+4}| + C$.
   (c) $I = -\frac{\cos^3 x}{3} + \frac{\cos^5 x}{5} + C$
   (d) $I = \frac{2}{13}e^{2x}\cos(3x) + \frac{3}{13}e^{2x}\sin 3x + C$
   (e) $I = \frac{1}{2}\left(3e^4 + 1\right)$
6. Use shells to get $V = \int_{1-\sqrt{2}}^{1+\sqrt{2}} 2\pi(x+6)(4x+2-2x^2)\,dx$
7. $W = \int_0^{10} 9.8(800 + (70-x)10)\,dx$
8. $A = \int_0^{\pi/4} \frac{\sin^2\theta}{2}\,d\theta + \int_{\pi/4}^{\pi/2} \frac{\cos^2\theta}{2}\,d\theta$
9. $f(x) = \sqrt{4} + \frac{(x-4)}{2\sqrt{4}} - \frac{(x-4)^2}{2!\cdot 4\cdot 4^{3/2}} + \ldots$ and the estimate is: $f(5) \approx \sqrt{4} + \frac{(5-4)}{2\cdot\sqrt{4}} = 2.25$