**Final Exam Review**
**Calculus II**
**Sheet 1**

These questions do not include the final section, 11.10. See Sheets 2 and 3 for the types of questions you'll see for this section.

1. State the definition of $\int_a^b f(x)\,dx$.

2. True or False, and give a short reason:

   (a) The Alternating Series Test is sufficient to show that a series is conditionally convergent.

   (b) You can use the Integral Test to show that a series is absolutely convergent.

   (c) Consider $\sum a_n$. If $\lim\limits_{n\to\infty} a_n = 0$, then the sum is said to converge.

   (d) All continuous functions have antiderivatives.

   (e) The sequence $a_n = 0.1^n$ converges to $\frac{1}{1-0.1}$

3. Set up an integral for the volume of the solid obtained by rotating the region defined by $y = \sqrt{x-1}$, $y = 0$ and $x = 5$ about the $y$–axis.

4. Write the area under $y = \sqrt[3]{x}$, $0 \le x \le 8$ as the limit of a Riemann sum (use right endpoints).

5. What is the derivative of $e^{-2x}$? The antiderivative of $e^{-3x}$? Same questions for $\sin(3x)$.

6. Find $\frac{dy}{dx}$, if $y = \int_{\cos(x)}^{5x} \cos(t^2)\,dt$

7. Let $f(x) = e^x$ on the interval $[0, 2]$. (a) Find the average value of $f$. (b) Find $c$ such that $f_{\text{avg}} = f(c)$.

8. The velocity function is $v(t) = 3t - 5$, $0 \le t \le 3$ (a) Find the displacement. (b) Find the distance traveled.

Does the series converge (absolute or conditional), or diverge?

9. $\sum\limits_{n=1}^{\infty} \dfrac{\cos(n/2)}{n^2 + 4n}$      10. $\sum\limits_{n=1}^{\infty} \dfrac{n^2 + 1}{5^n}$      11. $\sum\limits_{n=1}^{\infty} \dfrac{3^n n^2}{n!}$

Find the interval of convergence:

12. $\sum\limits_{n=1}^{\infty} \dfrac{n^2 x^n}{10^n}$      13. $\sum\limits_{n=1}^{\infty} \dfrac{(3x-2)^n}{n3^n}$      14. $\sum\limits_{n=1}^{\infty} \dfrac{(-1)^n x^{2n-1}}{(2n-1)!}$

Evaluate the integral:

15. $\displaystyle\int \dfrac{1}{y^2 - 4y - 12}\,dy$      17. $\displaystyle\int x^2 \cos(3x)\,dx$      19. $\displaystyle\int \dfrac{dx}{x\ln(x)}$

16. $\displaystyle\int \dfrac{2}{3x+1} + \dfrac{2x+3}{x^2+9}\,dx$      18. $\displaystyle\int_{-2}^{2} |x-1|\,dx$      20. $\displaystyle\int x\sqrt{x-1}\,dx$