Calculus II. Review for Test 2.

1. Set up these approximate integrations, using the method and number of rectangles n that is given. Don't work them out, just set up!

   $a)$ $\displaystyle\int_{-3}^{5} \frac{3x}{1+\ln|x|}dx$; Trapezoidal Rule with $n = 5$.

   $b)$ $\displaystyle\int_{0}^{1} xe^{(\sin x)}dx$; Midpoint Rule with $n = 3$.

   $c)$ $\displaystyle\int_{7}^{13} (x + \sin(\ln x))dx$; Simpsons Rule with $n = 6$.

   $d)$ $\displaystyle\int_{-2}^{3} (x^2 - \sin^2 x)dx$; Simpsons Rule with $n = 2$.

2. Show the correct form for a partial fraction decomposition of these functions. Don't actually solve for the variables.

   $a)\dfrac{x^2+1}{x^2(x+2)}$ $\quad b)\dfrac{x+3}{x^2-4}$ $\quad c)\dfrac{5x+1}{x^3-3x-2}$ Note that x=2 makes the denominator = 0.

3. Decompose the function into its partial fractions. (Actually solve for the variables.)

   $a)\dfrac{7x}{(x-1)(x^2+3)}$ $\quad b)\dfrac{x+3}{(x-2)(x+3)^2} = \dfrac{A}{x-2} + \dfrac{B}{(x+3)^2} + \dfrac{C}{x+3}$

4. Find the indefinite integrals:

   $a)$ $\displaystyle\int \frac{x^2+2x+3}{x(x+1)}dx$ $\quad b)$ $\displaystyle\int \frac{5x+1}{x^3-3x-2}dx$

5. Find these definite integrals and classify as "divergent" or "convergent":

   $a)$ $\displaystyle\int_{3}^{\infty} xe^{(-x^2)}dx$ $\quad b)$ $\displaystyle\int_{-1}^{0} \frac{3}{x^5}dx$ $\quad c)$ $\displaystyle\int_{-2}^{14} \frac{1}{\sqrt[4]{x+2}}dx$

6. For each of these sequences, find the limits, if they exist, and decide "diverges" or "converges."

   $a)$ $\displaystyle\lim_{n\to\infty} \frac{2^n+n}{3^n+1}$ $\quad b)$ $\displaystyle\lim_{n\to\infty} \frac{n+4n^3}{2n^4+1}$ $\quad c)$ $\displaystyle\lim_{n\to\infty} \frac{n^3+n^2}{7n^3+1}$

   $d)$ $\displaystyle\lim_{n\to\infty} \frac{7}{\cos(n\pi)}$ $\quad e)$ $\displaystyle\lim_{n\to\infty} \frac{\tan^{-1}(n)}{3}$ $\quad f)$ $\displaystyle\lim_{n\to\infty} \frac{(-1)^n}{3^n}$ $\quad g)$ $\displaystyle\lim_{n\to\infty} \frac{3^n(-1)^n}{2^n}$

7. For each series, what does the limit test for divergence tell us? [converge, diverge, or inconclusive] Show your work by performing the test.

$a) \sum_{n=1}^{\infty} \frac{e^{2n}+3n}{5e^{2n}-6}$ $\quad b) \sum_{n=1}^{\infty} \frac{2^n}{3^n}$ $\quad c) \sum_{n=1}^{\infty} \frac{3}{e^{2n}}$

8. For each series, what does the geometric series test tell us? [not applicable, converge, diverge, or inconclusive] Show your work, and find the value if it converges.

$a) \sum_{n=1}^{\infty} \frac{3^n}{\pi^n}$ $\quad b) \sum_{n=1}^{\infty} \frac{5^n}{(\sqrt{3})^n}$ $\quad c) \sum_{n=1}^{\infty} \frac{3}{(0.5)^n}$

$d) \sum_{n=1}^{\infty} \frac{1}{(-2)^n}$ $\quad e) \sum_{n=1}^{\infty} \frac{3}{e^{2n}}$ $\quad f) \sum_{n=1}^{\infty} \frac{n}{e^{2n}}$

9. For each series, what does the p-series test tell us? [not applicable, converge, diverge, or inconclusive] Show your work.

$a) \sum_{n=1}^{\infty} \frac{5^n}{(\sqrt{3})^n}$ $\quad b) \sum_{n=1}^{\infty} \frac{3}{n^{(0.5)}}$ $\quad c) \sum_{n=1}^{\infty} \frac{2}{n}$ $\quad d) \sum_{n=1}^{\infty} \left(\frac{1}{n}\right)^3$

10. For each series, what does the integral test tell us? [not applicable, converge, diverge, or inconclusive] Show your work.

$a) \sum_{n=1}^{\infty} \frac{\sqrt{n}+4}{n^2}$ $\quad b) \sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$ $\quad c) \sum_{n=1}^{\infty} \left(\frac{1}{n}\right)^3$

$d) \sum_{n=1}^{\infty} \frac{1}{(-2)^n}$ $\quad e) \sum_{n=1}^{\infty} \frac{1}{\cos^2(n)}$

11. For each series, what does the comparison test tell us? [not applicable, converge, or diverge] Show your work.

$a) \sum_{n=1}^{\infty} \frac{1}{2n^3+1}$ $\quad b) \sum_{n=1}^{\infty} \frac{9^n}{3+10^n}$ $\quad c) \sum_{n=1}^{\infty} \frac{6^n}{-4+5^n}$

$d) \sum_{n=1}^{\infty} \frac{(-1)^n}{-4+5^n}$

12. For each series, what does the limit comparison test tell us? [not applicable, converge, or diverge] Show your work.

$(a) \sum_{n=1}^{\infty} \frac{1}{2n+1}$ $\quad b) \sum_{n=1}^{\infty} \frac{n+2}{(n+1)^3}$ $\quad c) \sum_{n=1}^{\infty} \frac{2^n}{5^n-n}$

13. For each series, use the alternating series test or the limit test for divergence to decide: [converge, or diverge]. Show your work.

$a) \sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(n+1)}$ $\qquad b) \sum_{n=1}^{\infty} \frac{(-1)^n}{4n+1}$ $\qquad c) \sum_{n=1}^{\infty} \frac{(-1)^n}{e^{-n}}$

14. Decide if the sums converge or diverge, explain why. If there is a formula for the sum, find the value.

$a) \sum_{n=1}^{\infty} n^2 e^{-n^3}$ $\qquad b) \sum_{n=1}^{\infty} e^{2n}$ $\qquad c) \sum_{n=1}^{\infty} \frac{2^n}{e^{3n}}$

15. Also study the quizzes, and the homework questions. These are good test questions too!