Calculus II. Review for Test 2.

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

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

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

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

3. Find the indefinite integrals:

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

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

   $a)\displaystyle\int_3^\infty xe^{(-x^2)}dx$ $\qquad b)\displaystyle\int_{-1}^0\frac{3}{x^5}dx$ $\qquad c)\displaystyle\int_{-2}^{14}\frac{1}{\sqrt[4]{x+2}}dx$

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

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

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

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

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

7. 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

14. For each series, what does the ratio test tell us? [converge absolutely, diverge, or inconclusive]. Show your work by finding the limit.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-2)^n}{n!}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{2^{(n^2)}}{(2n)!}$

15. For each series, what does the root test tell us? [converge absolutely, diverge, or inconclusive]. Show your work by finding the limit.

(a) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{-2n}{3n+1}\right)^n$

(b) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1}{\sqrt{n}}\right)^n$

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