MA 114 Worksheet #04: Integration by Partial Fractions

1. Write out the general form for the partial fraction decomposition but do not determine the numerical value of the coefficients.

   (a) $\dfrac{1}{x^2+3x+2}$

   (b) $\dfrac{x+1}{x^2+4x+4}$

   (c) $\dfrac{x}{(x^2+1)(x+1)(x+2)}$

   (d) $\dfrac{2x+5}{(x^2+1)^3(2x+1)}$

2. Based on your work in the previous question, can you conjecture (guess) a relation between the degree of the denominator of the rational function and the number of coefficients in the partial fraction decomposition?

3. Find the partial fraction decomposition for the following rational functions.

   (a) $\dfrac{1}{x^2-4}$

   (b) $\dfrac{x^3}{x^2-4}$ Hint: This is not a proper rational function, so you will begin by dividing.

   (c) $\dfrac{x}{(x^2+1)(x+1)}$

4. Compute the following integrals.

   (a) $\displaystyle\int \frac{x-9}{(x+5)(x-2)}\,dx$

   (b) $\displaystyle\int \frac{1}{x^2+3x+2}\,dx$

   (c) $\displaystyle\int \frac{x^3-2x^2+1}{x^3-2x^2}\,dx$

   (d) $\displaystyle\int \frac{x^3+4}{x^2+4}\,dx$

   (e) $\displaystyle\int \frac{1}{x(x^2+1)}\,dx$

5. Compute

$$\int \frac{1}{\sqrt{x}-\sqrt[3]{x}}\,dx$$

   by first making the substitution $u = \sqrt[6]{x}$.

MA 114 MathExcel - Worksheet # 4: Integration using Partial Fractions

1. If you have not done so already, find the numerical value of the coefficients used in question 1 above.

2. Evaluate the following

   (a) $\displaystyle\int \frac{x^3 - 2x^2 + 2x - 5}{x^4 + 4x^2 + 3}\, dx$

   (b) $\displaystyle\int \frac{\sqrt{t+4}}{t}\, dt$

   (c) $\displaystyle\int y \sec^2(y)\, dy$

   (d) $\displaystyle\int se^{2s}\, ds$

   (e) $\displaystyle\int \frac{\cos(x)}{\sin^3(x) - \sin(x)}\, dx$