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

3. Compute
$$\int \frac{1}{\sqrt{x} - \sqrt[3]{x}}\, dx$$
   by first making the substitution $u = \sqrt[6]{x}$.