

## MA 114 Worksheet # 17: Integration by Partial Fractions

1. Conceptual Understanding: Your lecture described four cases for partial fraction decomposition. An example of each case occurs below. Write out the general form for the partial fraction decomposition but do not determine the numerical value of the coefficients.

(a)  $\frac{3}{x^2 + 2x + 4}$

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

(c)  $\frac{1}{x^2 + 3x + 2}$

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

2. Compute the following integrals.

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

(b)  $\int \frac{x - 9}{(x + 5)(x - 2)} dx$

(c)  $\int_0^1 \frac{x^3 + 4}{x^2 + 4} dx$

(d)  $\int \frac{1}{x^2 + 3x + 2} dx$

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

[Hint: to compute an integral of the form  $\int \frac{A}{(1 + x^2)} dx$  substitute  $x = \tan \theta$ .]

3. Compute

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

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