

Part 1.

For each of the following problems, evaluate the integral by using the partial fraction decomposition provided.

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

$$\text{given that } \frac{1}{x^2 - 2x - 3} = \frac{1/4}{x-3} - \frac{1/4}{x+1}$$

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

$$\text{given that } \frac{x^2 + 1}{x^3 - x^2} = -\frac{1}{x} - \frac{1}{x^2} + \frac{2}{x-1}$$

$$(c) \int \frac{x-2}{x^4 + x^2} dx,$$

$$\text{given that } \frac{x-2}{x^4 + x^2} = \frac{1}{x} - \frac{2}{x^2} + \frac{-x+2}{1+x^2}$$

Find the partial fraction decomposition of each fraction below.

Part 2.

$$a) \frac{x+2}{x^2 + 12x + 32}$$

$$b) \frac{2}{x^2 - 2x}$$

$$c) \frac{-2x^2 + 8x + 6}{x^3 - 3x^2 - 9x + 27}$$

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

$$e) \frac{6x^2 - 5}{x^3 + x^2 + x + 1}$$

$$f) \frac{6x^2 - 28x + 33}{(x-2)^2(x-1)}$$

$$g) \frac{2x^3 - 19x + 9}{x^2 - 9}$$

$$h) \frac{3x^3 - x^2 + 19x - 9}{x^4 + 18x^2 + 81}$$