Handout 3: Simplifying Antidifferentiation Using Partial Fractions

1. Evaluate the indefinite integral: $\int \frac{1}{x^2 - x}\,dx$.

2. Evaluate the indefinite integral: $\int \frac{x+2}{x^2 - 1}\,dx$.

3. Evaluate the indefinite integral: $\int \frac{1}{(x-3)(x+1)^2}\,dx$.

4. Evaluate the indefinite integral: $\int \frac{x}{(x+1)(x^2+4)}\,dx$.

5. Evaluate the indefinite integral: $\int \frac{3x^3 + 6x^2 + 5x + 6}{(x+1)^2(x^2+1)}\,dx.$

6. Evaluate the indefinite integral: $\int \frac{2x^2 - 8}{x^3 - 4x^2 + 5x - 2}\,dx.$

7. Evaluate the indefinite integral: $\int \frac{x+1}{x^4 - 3x^3 - 3x^2 + 7x + 6}\,dx$.

Answers

1. $\int \frac{1}{x^2 - x}\,dx = \ln(x-1) - \ln(x) + C$

2. $\int \frac{x+2}{x^2-1}\,dx = \frac{3}{2}\ln(x-1) - \frac{1}{2}\ln(x+1) + C$

3. $\int \frac{1}{(x-3)(x+1)^2}\,dx = \frac{1}{16}\ln(x-3) - \frac{1}{16}\ln(x+1) + \frac{1}{4}(x+1)^{-1} + C$

4. $\int \frac{x}{(x+1)(x^2+4)}\,dx = \frac{-1}{5}\ln(x+1) + \frac{1}{10}\ln(x^2+4) + \frac{2}{5}\arctan\left(\frac{x}{2}\right) + C$

5. $\int \frac{3x^3 + 6x^2 + 5x + 6}{(x+1)^2(x^2+1)}\,dx = 3\ln(x+1) - 2(x+1)^{-1} + \arctan(x) + C$

6. $\int \frac{2x^2 - 8}{x^3 - 4x^2 + 5x - 2}\,dx = 2\ln(x-1) - 6(x-1)^{-1} + C$

7. $\int \frac{x+1}{x^4 - 3x^3 - 3x^2 + 7x + 6}\,dx = \frac{1}{4}\ln(x-3) - \frac{1}{3}\ln(x-2) + \frac{1}{12}\ln(x+1) + C$