

Unit 5. Integration techniques

Problem Set 10

5E. Integration by partial fractions

$$2) \int \frac{u du}{(u-2)(u+3)} = \int \left(\frac{2/5}{(u-2)} + \frac{3/5}{(u+3)} \right) du = \frac{2}{5} \ln(u-2) + \frac{3}{5} \ln(u+3) + C$$

$$3) \int \frac{u du}{(u+2)(u-2)(u+3)} = \frac{1}{10} \ln(u-2) + \frac{1}{2} \ln(u+2) + (-\frac{3}{5}) \ln(u+3) + C$$

$$5) \int \frac{3u+2}{u(u+1)^2} du = \int \left(\frac{2}{u} + \frac{-2}{u+1} + \frac{1}{(u+1)^2} \right) du = 2 \ln(u) - 2 \ln(u+1) - \frac{1}{u+1} + C$$

$$6) \int \frac{2u-9}{(u^2+9)(u+2)} du = \int \left(\frac{-1}{(u+2)} + \frac{x}{u^2+9} \right) du = -\ln(u+2) + \frac{1}{2} \ln(u^2+9) + C$$

$$7. h) \int \frac{(u^2+1) du}{(u+1)^2+1}$$

5F. Integration by parts.

Reduction formulas

$$1a) \int u^n \ln u du = \frac{u^{n+1}}{n+1} \ln u - \int \frac{u^n}{n+1} + C$$

$$2d) \int u^n e^{au} du = u^n \frac{e^{au}}{a} - \int n u^{n-1} \frac{e^{au}}{a} + C$$

$$2b) \int u^2 e^u du = u^2 e^u - \int 2u e^u du = u^2 e^u - (2(e^u u - \int e^u)) + C$$

$$3) \int \sin^{-1}(4u) du = u \cdot \sin^{-1}(4u) - \int u \cdot \frac{4}{\sqrt{1-16u^2}} du$$