Partial Fractions

Split the following into partial fractions. Solve for the coefficients in the first problem.

- $\dfrac{4+x}{(1+2x)(3-x)}$ *

- $\dfrac{x^4}{x^3+x^4}$

- $\dfrac{x-6}{x^2+x-6}$

- $\dfrac{x^4}{(x^2-x+1)(x^2+2)^2}$

- $\dfrac{x^5+1}{(x^2-x)(x^4+2x^2+1)}$

Long Division with Polynomials

Reduce the following rational expressions:

- $\dfrac{x^4}{x-1}$

- $\dfrac{x^5+x-1}{x^3+1}$

- $\dfrac{3x^2+6x+2}{x^2+3x+2}$

Perform the following integration:

- $\int \dfrac{2}{x^2-1}\,dx$

Strategy for Integration

Steps:

- Simplify

- U-Substitution?

- Other Techniques based on its Form (e.g. does it look like Trig Substitution?)

- Didn't work? Try Again.

Solve the following problems:

- $\int \sqrt{3 - 2x - x^2}\,dx$

- $\int \dfrac{1 + \sin x}{1 + \cos x}\,dx$

- $\int x\sqrt{2 - \sqrt{1 - x^2}}\,dx$

- $\int (x + \sin x)^2\,dx$

- $\int \dfrac{dx}{\sqrt{x} + x\sqrt{x}}$

- $\int \dfrac{1}{x^7 - x}\,dx$

  This last one is incredibly tricky, but if you're on the right track, the answer is very short. Hint: Don't use partial fractions.

Improper Integrals

Solve the following integrals:

- $\displaystyle\int_2^\infty e^{-5p}\,dp$

- $\displaystyle\int_{-\infty}^\infty xe^{-x^2}\,dx$

- $\displaystyle\int_0^\infty \dfrac{x^2}{\sqrt{1 + x^3}}\,dx$

- $\displaystyle\int_0^1 \dfrac{1}{x}\,dx$

- $\displaystyle\int_{-2}^{14} \dfrac{dx}{\sqrt[4]{x + 2}}$

- $\displaystyle\int_0^1 \dfrac{1}{\sqrt{1 - x^2}}\,dx$