

# Calculus II

## Homework

### Partial fractions

1. Integrate. Some of the examples require partial fraction decomposition and some do not. Illustrate the steps of your solution.

(a)  $\int \frac{1}{4x^2 + 4x + 1} dx$

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

(c)  $\int \frac{1}{5 - x^2} dx$

(d)  $\int \frac{x}{4x^2 + x + \frac{1}{16}} dx$

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

(f)  $\int \frac{x}{4x^2 + x + 5} dx$

(g)  $\int \frac{x}{4x^2 + x - 5} dx$

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

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

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

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

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

(m)  $\int \frac{1}{2x^2 + 5x + 1} dx$

2. Evaluate the indefinite integral. Illustrate all steps of your solution.

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

(b)  $\int \frac{4x^2}{2x^2 - 1} dx$

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

(d)  $\int \frac{x^3}{x^2 + 3x - 4} dx$

(e)  $\int \frac{x^3}{2x^2 + 3x - 5} dx$

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

(g)  $\int \frac{x^4}{(x + 1)^2(x + 2)} dx$

(h)  $\int \frac{15x^2 - 4x - 81}{(x - 3)(x + 4)(x - 1)} dx$

(i)  $\int \frac{x^4 + 10x^3 + 18x^2 + 2x - 13}{x^4 + 4x^3 + 3x^2 - 4x - 4} dx$

Check first that  $(x - 1)(x + 2)^2(x + 1) = x^4 + 4x^3 + 3x^2 - 4x - 4$ .

(j)  $\int \frac{x^4}{(x^2 + 2)(x + 2)} dx$

(k)  $\int \frac{x^5}{x^3 - 1} dx$

(l)  $\int \frac{x^4}{(x^2 + 2)(x + 1)^2} dx$

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

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

3. Integrate

$$\int \frac{x^6 - x^5 + \frac{9}{2}x^4 - 4x^3 + \frac{13}{2}x^2 - \frac{7}{2}x + \frac{11}{4}}{x^5 - x^4 + 3x^3 - 3x^2 + \frac{9}{4}x - \frac{9}{4}} dx \quad .$$