

MTH 162 Homework 9

Do the first **six** problems. Due: Mar 26, 2014 (Wednesday). Hand in to me during the class.

Compulsory:

Ex 6.2

42–60 Evaluate the integral.

56. $\int_0^1 \sqrt{x^2 + 1} \, dx$ **58.** $\int_0^1 \frac{dx}{(x^2 + 1)^2}$ [You may need the formula: $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$]

Ex 6.3

1–6 ■ Write out the form of the partial fraction decomposition of the function (as in Example 6). Do not determine the numerical values of the coefficients.

(e.g. $\frac{1}{x(x+1)} = \frac{A}{x} + \frac{B}{x+1}$)

1. (a) $\frac{1 + 6x}{(4x - 3)(2x + 5)}$

(b) $\frac{10}{5x^2 - 2x^3}$

3. (a) $\frac{x^4 + 1}{x^5 + 4x^3}$

(b) $\frac{1}{(x^2 - 9)^2}$

6. (a) $\frac{t^6 + 1}{t^6 + t^3}$

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

(You may have to do a long division first. You may also need: $t^3+1 = (t+1)(t^2-t+1)$)

7–34 ■ Evaluate the integral.

16. $\int_0^1 \frac{x^3 - 4x - 10}{x^2 - x - 6} \, dx$

Recommended: (These types of questions may also appear in the exams)

Ex 6.3

1–6 ■ Write out the form of the partial fraction decomposition of the function (as in Example 6). Do not determine the numerical values of the coefficients.

1. (a) $\frac{1 + 6x}{(4x - 3)(2x + 5)}$

(b) $\frac{10}{5x^2 - 2x^3}$

2. (a) $\frac{x}{x^2 + x - 2}$

(b) $\frac{x^2}{x^2 + x + 2}$

3. (a) $\frac{x^4 + 1}{x^5 + 4x^3}$

(b) $\frac{1}{(x^2 - 9)^2}$

4. (a) $\frac{x^4 - 2x^3 + x^2 + 2x - 1}{x^2 - 2x + 1}$

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

5. (a) $\frac{x^6}{x^2 - 4}$

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

6. (a) $\frac{t^6 + 1}{t^6 + t^3}$

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

7–34 ■ Evaluate the integral.

7. $\int \frac{x^4}{x - 1} dx$

8. $\int \frac{3t - 2}{t + 1} dt$

9. $\int \frac{5x + 1}{(2x + 1)(x - 1)} dx$

10. $\int \frac{y}{(y + 4)(2y - 1)} dy$

11. $\int_0^1 \frac{2}{2x^2 + 3x + 1} dx$

12. $\int_0^1 \frac{x - 4}{x^2 - 5x + 6} dx$

13. $\int \frac{ax}{x^2 - bx} dx$

14. $\int \frac{1}{(x + a)(x + b)} dx$

15. $\int_0^1 \frac{2x + 3}{(x + 1)^2} dx$

16. $\int_0^1 \frac{x^3 - 4x - 10}{x^2 - x - 6} dx$

17. $\int_1^2 \frac{4y^2 - 7y - 12}{y(y + 2)(y - 3)} dy$

18. $\int \frac{x^2 + 2x - 1}{x^3 - x} dx$

19.
$$\int \frac{x^2 + 1}{(x - 3)(x - 2)^2} dx$$

20.
$$\int \frac{x^2 - 5x + 16}{(2x + 1)(x - 2)^2} dx$$

21.
$$\int \frac{x^3 + 4}{x^2 + 4} dx$$

22.
$$\int \frac{x^2 - x + 6}{x^3 + 3x} dx$$

23.
$$\int \frac{10}{(x - 1)(x^2 + 9)} dx$$

24.
$$\int \frac{x^2 - 2x - 1}{(x - 1)^2(x^2 + 1)} dx$$

25.
$$\int \frac{x^3 + x^2 + 2x + 1}{(x^2 + 1)(x^2 + 2)} dx$$

26.
$$\int \frac{x^3 - 2x^2 + x + 1}{x^4 + 5x^2 + 4} dx$$

27.
$$\int \frac{x + 4}{x^2 + 2x + 5} dx$$

28.
$$\int_0^1 \frac{x}{x^2 + 4x + 13} dx$$

29.
$$\int \frac{1}{x^3 - 1} dx$$

30.
$$\int \frac{x^5 + x - 1}{x^3 + 1} dx$$

31.
$$\int \frac{dx}{x(x^2 + 4)^2}$$

32.
$$\int \frac{x^4 + 3x^2 + 1}{x^5 + 5x^3 + 5x} dx$$

33.
$$\int \frac{x - 3}{(x^2 + 2x + 4)^2} dx$$

34.
$$\int \frac{x^4 + 1}{x(x^2 + 1)^2} dx$$

35–40 ■ Make a substitution to express the integrand as a rational function and then evaluate the integral.

35.
$$\int_9^{16} \frac{\sqrt{x}}{x - 4} dx \quad (\text{Let } u = \sqrt{x}.)$$

36.
$$\int_0^1 \frac{1}{1 + \sqrt[3]{x}} dx \quad (\text{Let } u = \sqrt[3]{x}.)$$

37.
$$\int \frac{x^3}{\sqrt[3]{x^2 + 1}} dx$$

38.
$$\int_{1/3}^3 \frac{\sqrt{x}}{x^2 + x} dx$$

39.
$$\int \frac{e^{2x}}{e^{2x} + 3e^x + 2} dx$$

40.
$$\int \frac{\sin x}{\cos^2 x - 3 \cos x} dx$$