

MATH181 Homework Sheet 5

Due 7th November 2011

See Stroud, chapter F.12, chapter,15, chapter 16.

1. Use partial fractions to sketch the function

$$f(x) = \frac{x^2 - 7x + 10}{x - 1} .$$

Find the stationary points of $f(x)$.

2. Find the steepest point on the curve

$$y = \frac{2e^x}{e^x + 4} .$$

What is the gradient at this point?

3. Use integration by parts to find

$$(i) \int x e^{3x} dx \quad \text{and} \quad (ii) \int x^2 \cosh 3x dx .$$

4. Evaluate the integrals

$$(i) \int \frac{dx}{(x+3)(x+5)}, \quad (ii) \int \frac{(x+1)dx}{(x+3)(x+5)},$$

$$(iii) \int (4-3x)^4 dx, \quad (iv) \int \sin 5x \cos 2x dx ,$$

$$(v) \int_{-1}^1 \frac{dx}{(x-2)^4}, \quad (vi) \int_0^\pi \cos^2 x dx .$$

5. Use the substitution $x = 3 \cosh u$ to show that

$$\int \frac{dx}{\sqrt{x^2 - 9}} = \cosh^{-1} \frac{x}{3} + C .$$

(Note that $\cosh^2 x - \sinh^2 x = 1$.)

6. Use the substitution $x = 3 \tan \theta$ to find

$$\int_0^3 \frac{dx}{x^2 + 9} .$$

7. Evaluate the integrals

$$(i) \int_0^8 x^{-\frac{1}{5}} dx . \quad (ii) \int_1^\infty \frac{dx}{x^3}$$