

Practice on Substitution and Algebraic Manipulation of Integrals

Do the following problems for practice. Problems 1-4 are for review.

1. Complete the square on the following expressions: (a) $x^2 + 5x - 1$, (b) $-2x^2 + x - 3$, (c) $x^2 - 6x + 4$
2. Let $a \neq 0$ and b, c be constants. Complete the square on $ax^2 + bx + c = 0$ to derive the quadratic formula.
3. Perform the following polynomial divisions: (a) $\frac{x^2-6x+1}{x+2}$, (b) $\frac{2x^3-5x^2+x-1}{x^2+x-2}$, (c) $\frac{x^4-2x^3+1}{x+5}$
4. Consider the polynomial $P(x) = x^3 - 6x^2 + 11x - 6$. Find all the roots of $P(x)$.
Suggestion: Find one of the roots by inspection and then use polynomial division to find the factors.
5. Evaluate the following definite and indefinite integrals.

(a) $\int_1^{\sqrt{2}} \frac{x}{3+x^4} dx$	(b) $\int \frac{dx}{x^2-6x+14}$	(c) $\int_{\sqrt{2}}^3 \frac{2x^3}{x^2-1} dx$
(d) $\int \frac{\ln(x+1)}{x+1} dx$	(e) $\int_{-1}^3 \frac{4x^2-7}{2x+3} dx$	(f) $\int \frac{1-x}{\sqrt{1-x^2}} dx$
(g) $\int \frac{x^2-2x+3}{x+5} dx$	(h) $\int \frac{dx}{\sqrt{1-4x-x^2}}$	(i) $\int_0^{\pi/4} \frac{\sin(2x)}{\cos x+1} dx$