

MA3180 (Financial Mathematics I) Assignment 3

1. Calculate the following integrals:

- (i) $\int (1 + x^3) dx$.
- (ii) $\int_0^{\pi/2} (1 + \cos(2x)) dx$.
- (iii) $\int_0^1 (x^{1/2} + e^{3x}) dx$.
- (iv) $\int (1 + x^3)^2 dx$.
- (v) $\int \frac{1}{1-x} dx$.
- (vi) $\int \frac{1}{2-3x^2} dx$.
- (vii) $\int \frac{x^2}{1+x^3} dx$.
- (viii) $\int \frac{1+x}{1+x^2} dx$.
- (ix) $\int x \sin(2x) dx$.
- (x) $\int e^{-x} \sin(2x) dx$.
- (xi) $\int x \sqrt{2-5x} dx$.
- (xii) $\int x \log(2x) dx$.

2. Calculate the following integrals.

- (i) $\int_0^2 \int_0^3 e^{x-y} dx dy$.
- (ii) $\int_0^{\pi/4} \int_0^3 \sin x dx dy$.
- (iii) $\int_0^1 \int_0^1 \frac{xy}{\sqrt{x^2+y^2+1}} dx dy$.
- (iv) $\int_R \frac{1+x}{1+y} dx dy$, where $R = \{(x, y) | -1 \leq x \leq 2, 0 \leq y \leq 1\}$.
- (v) $\int_R x \sin(x+y) dx dy$, where $R = [0, \pi/6] \times [0, \pi/3]$.

3. Calculate the following integral over general regions.

- (i) $\int_0^1 \int_{1-x}^{1+x} (2x - 3y^2) dx dy$.
- (ii) $\int_R xy dx dy$, where $R = \{(x, y) | 0 \leq x \leq 1, x^2 \leq y \leq \sqrt{x}\}$.
- (iii) $\int_R (3x + y) dA$, where $R = \{(x, y) | \pi/6 \leq x \leq \pi/4, \sin x \leq y \leq \cos x\}$.
- (iv) $\int_D x \cos y dA$, where D is bounded by $y = 0$, $y = x^2$ and $x = 1$.
- (v) $\int_D (y^2 - x) dA$, where D is bounded by $x = y^2$ and $x = 3 - 2y^2$.