Integration

i. **Compute the following integrals:**

- $\int x^2 \, dx$
- $\int x^5 \, dx$
- $\int 4x^3 \, dx$
- $\int 5x^{-2} \, dx$
- $\int 7x^2 + 3 \, dx$

- $\int \sqrt{x} \, dx$
- $\int 6\sqrt[3]{x} \, dx$
- $\int x^5 - 6x^2 \, dx$
- $\int \dfrac{8}{x^2} \, dx$
- $\int -x \, dx$

ii. **The curve C has an equation such that $\dfrac{dy}{dx} = \dfrac{6}{x^2} + 3x - 2$. Find a general equation for the curve C in terms of y.**

iii. **The curve C has equation $y = f(x)$, $x \neq 0$, and the point $P(3, 2)$ lies on C. Given that:**

$$f'(x) = 3x^2 - 6 + \frac{9}{x^3}$$

Find $f(x)$.

iv. **Calculate the following integrals:**

- $\int (2x + 5)(x - 3) \, dx$
- $\int \dfrac{x^2 + 5x - 3x^4}{x} \, dx$
- $\int \dfrac{3x^4 + 9x^3 - 7x^2}{x^2} \, dx$
- $\int (x + 4)^2 \, dx$

v. **The curve C has equation $y = g(x)$, $x > 0$, and $g'(x) = 4x - 6\sqrt{x} + \dfrac{4}{x^2}$. Given that the point $P(4, 1)$ lies on C, find $f(x)$ and simplify.**