

Basic Integration Quiz

$$1) \int 4x^2 + 2x - 1 + \frac{2}{\sqrt{x}} + \frac{3}{\sqrt[3]{x^2}} dx$$

$$= \int 4x^2 dx + \int 2x dx - \int 1 \cdot dx + 2 \int x^{-1/2} dx + 3 \int x^{-2/3} dx$$

$$= \frac{4x^3}{3} + \frac{2x^2}{2} - x + \frac{2x^{-1/2+1}}{1-\frac{1}{2}} + 3 \frac{x^{-2/3+1}}{-\frac{2}{3}+1} + C$$

$$= \frac{4x^3}{3} + x^2 - x + 4x^{1/2} + \frac{3 \cdot 3 x^{1/3}}{1} + C$$

$$= \frac{4x^3}{3} + x^2 - x + 4\sqrt{x} + \frac{9}{1} \sqrt[3]{x} + C$$

$$2) \int (x^3 + 3)^2 dx$$

$$= \int x^6 + 9 + 6x^3 dx$$

$$= \int x^6 dx + \int 9 dx + 6 \int x^3 dx$$

$$= \frac{x^7}{7} + 9x + \frac{6x^4}{4} + C$$

$$= \frac{x^7}{7} + 9x + \frac{3}{2}x^4 + C$$

$$3) \int = \int \frac{4\sqrt[3]{z} - 3\sqrt{z}}{2\sqrt[3]{z}} dz$$

$$= \int \frac{4\sqrt[3]{z}}{2\sqrt[3]{z}} - \frac{3\sqrt{z}}{2\sqrt[3]{z}} dz$$

$$= \int 2 - \frac{3}{2} z^{\frac{1}{2} - \frac{1}{3}} dz$$

$$= \int 2 - \frac{3}{2} z^{\frac{1}{6}} dz$$

$$= \int 2 dz - \frac{3}{2} \int z^{\frac{1}{6}} dz$$

$$= 2z - \frac{3}{2} \frac{z^{\frac{1}{6}+1}}{\frac{1}{6}+1} + C$$

$$= 2z - \frac{3 \cdot 6}{2 \cdot 7} z^{\frac{7}{6}} + C$$

$$= 2z - \frac{9}{7} z^{\frac{7}{6}} + C$$

$$4) \int \frac{x^5 + 2x^3 - 2x^2 - 4}{x^2 + 2} dx$$

$$= \int \frac{x^3(x^2+2) - 2(x^2+2)}{(x^2+2)} dx$$

$$= \int \frac{x^3(x^2+2)}{(x^2+2)} dx - 2 \int \frac{x^2+2}{x^2+2} dx$$

$$= \int x^3 dx - 2 \int 1 dx$$

$$= \frac{x^4}{4} - 2x + C$$