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Expression for formula of integration by parts

$$\int (uv)dx = u\int vdx - \int (\frac{du}{dx}\int vdx)dx$$

Derivation for expression of formula of integration by parts

- $$\frac{d}{dx}(uv_1) = \frac{du}{dx}v_1 + u\frac{dv_1}{dx}$$
- Integrating both sides,
- $$uv_1 = \int (\frac{du}{dx}v_1)dx + \int (u\frac{d_{v1}}{dx})dx$$
- $$\int (u\frac{dv_1}{dx})dx = uv_1 - \int (\frac{du}{dx}v_1)dx$$
- $$v = \frac{dv_1}{dx}$$
- $$v_1 = \int vdx$$
- $$\int (uv)dx = u\int vdx - \int (\frac{du}{dx}\int vdx)dx$$

Expression for formula of integration of product of e raised to the power ax with cosine of bx

- $$\int e^{ax}\cos bxdx = \frac{e^{ax}(a\cos bx + b\sin bx)}{a^2+b^2}$$

Derivation for expression of formula of integration of product of e raised to the power ax with cosine of bx

- $$\int e^{ax}\cos(bx) = e^{ax}\int \cos(bx)dx - \int (\frac{de^{ax}}{dx}\int cosbxdx)dx$$

- $$= \frac{e^{ax}\sin bx}{b} - \frac{a}{b}\int e^{ax}\sin bx dx$$
- $$= \frac{e^{ax}\sin bx}{b} - \frac{a}{b}[e^{ax}\int \sin bx dx - \int (\frac{de^{ax}}{dx}\int \sin bx dx) dx]$$
- $$= \frac{e^{ax}\sin bx}{b} + \frac{a}{b^2}e^{ax}\cos bx - \frac{a^2}{b^2}\int e^{ax}\cos bx dx$$
- $$\frac{a^2+b^2}{b^2}\int e^{ax} cos bx dx = e^{ax}\frac{(b\sin bx + a\cos bx)}{b^2}$$
- $$\int e^{ax}\cos bx dx = \frac{e^{ax}(a\cos bx + b\sin bx)}{a^2+b^2}$$

Expression for formula of integration of product of e raised to the power of ax with sine of bx

- $$\int e^{ax}\sin bx dx = \frac{e^{ax}(a\sin bx - b\cos bx)}{a^2+b^2}$$

Derivation for expression for formula of integration of square root of sum of square of x and square of a

- $$\int \sqrt{x^2+a^2} dx = \sqrt{x^2+a^2}\int 1 dx - \int (\frac{d\sqrt{x^2+a^2}}{dx}\int 1 dx) dx$$
- $$= x\sqrt{x^2+a^2} - \int \frac{2x}{2\sqrt{x^2+a^2}} x dx$$
- $$= x\sqrt{x^2+a^2} - \int \frac{(x^2+a^2)-a^2}{\sqrt{x^2+a^2}} dx$$
- $$= x\sqrt{x^2+a^2} - \int \sqrt{x^2+a^2} dx + a^2\int \frac{dx}{\sqrt{x^2+a^2}}$$
- $$2\int \sqrt{x^2+a^2} dx = x\sqrt{x^2+a^2} + a^2\log(x+\sqrt{x^2+a^2})$$
- $$\int \sqrt{x^2+a^2} = \frac{x\sqrt{x^2+a^2}}{2} + \frac{a^2}{2}\log(x+\sqrt{x^2+a^2})$$

Expression for formula of integration of square root of sum of square of x and square of a

- $$\int \sqrt{x^2+a^2} = \frac{x\sqrt{x^2+a^2}}{2} + \frac{a^2}{2}\log(x+\sqrt{x^2+a^2})$$

Expression for formula of integration of square root of difference of square of x and square of a

$$\int \sqrt{x^2-a^2}dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\log(x+\sqrt{x^2-a^2})$$

Expression for formula of integration of square root of difference of square of a and square of x

$$\int \sqrt{a^2-x^2}dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}$$

Expression for integration of product of mx + e with square root of quadratic function in terms of p and q

$$\int (mx+e)\sqrt{ax^2+bx+c}dx = p\int (2ax+b)\sqrt{ax^2+bx+c}dx + q\int \sqrt{ax^2+bx+c}dx$$

Expression of p in resolution of integration of square root of quadratic functions

$$p = \frac{m}{2a}$$

Expression for q in resolution of integration of square root of quadratic functions

$$q = e - bp$$