1) $2x^2 \ln x$

$$\int 2x^2 \times \ln(x)\, dx$$

$$2 \times \int \ln(x) \times x^2\, dx$$

$$2\left(\ln(x) \times \frac{x^3}{3} - \int \frac{x^3}{3} \times \frac{1}{x}\, dx\right)$$

$$2\left(\ln(x) \times \frac{x^3}{3} - \int \frac{x^2}{3}\, dx\right)$$

$$2\left(\ln(x) \times \frac{x^3}{3} - \frac{1}{3}\int x^2\, dx\right)$$

$$2\left(\ln(x) \times \frac{x^3}{3} - \frac{1}{3} \times \frac{x^3}{3}\right)$$

$$\frac{2x^3 \times \ln(x)}{3} - \frac{2x^3}{9}$$

$$\Rightarrow \frac{2x^3 \times \ln(x)}{3} - \frac{2x^3}{9} + C$$

2. $3te^{2t}$

$$\int 3te^{2t}\, dx$$

$$3te^{2t} x$$

$$\Rightarrow 3te^{2t}x + C$$

3.) $x^2 \sin x$

$$\int x^2 \sin x\, dx$$

$$x^2 \times \left(-\cos(x)\right) - \int -\cos(x) \times 2x\, dx$$

$$x^2 \times \left(-\cos(x)\right) - 1 \times (-2) \times \int \cos(x) \times x\, dx$$

$$x^2 \times (-\cos(x)) + 2x \int x \times \cos(x)\, dx$$

$$x^2 \times (-\cos(x)) + 2\left(x \times \sin(x) - \int \sin(x)\right)$$

$$x^2 \times (-\cos(x)) + 2(x \times \sin(x) - (-\cos(x)))$$

$$-x^2 \times \cos(x) + 2x \times \sin(x) + 2\cos(x)$$

$$\Rightarrow -x^2 \times \cos(x) + 2x \times \sin(x) + 2\cos(x) + C$$

4.) $\cos 5x \cos 6x$

$$\int \cos 5x \cos 6x\, dx$$

$$\int \frac{1}{2} \times (\cos(-x) + \cos(11x))\, dx$$

$$\int \frac{1}{2} \times (\cos(x) + \cos(11x))\, dx$$

$$\frac{1}{2} \times \int \cos(x) + \cos(11x)\, dx$$

$$\frac{1}{2} \times \int \cos x\, dx + \int \cos 11x\, dx$$

$$\frac{1}{2} \times \left(\sin x + \frac{\sin 11x}{11}\right)$$

$$\Rightarrow \frac{\sin x}{2} + \frac{\sin 11x}{22} + C$$

5.)

5.) $\sin 7x \cos 2x$

$$\int \sin 7x \cos 2x \, dx$$

$$\int \frac{1}{2} \times \sin 9x + \sin 5x \, dx$$

$$\frac{1}{2} \times \int \sin 9x + \sin 5x \, dx$$

$$\frac{1}{2} \times \int \sin 9x \, dx + \int \sin 5x \, dx$$

$$\frac{1}{2} \times \left(\frac{-\cos 9x}{9} - \frac{\cos 5x}{5} \right)$$

$$\frac{-\cos 9x}{18} - \frac{\cos 5x}{10}$$

$$\Rightarrow -\frac{\cos 9x}{18} - \frac{\cos 5x}{10} + C .$$