$$\int 5x - 3x^2 dx$$

Apply the Sum Rule: $\int f(x) \pm g(x) dx = \int f(x) dx \pm \int g(x) dx$

$$= \int 5x dx - \int 3x^2 dx$$

$$\int 5x dx = \frac{5x^2}{2}$$

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

$$= \frac{5x^2}{2} - x^3$$

Add a constant to the solution

$$= \frac{5x^2}{2} - x^3 + C$$

$$\int_1^2 x^2 - 2x dx$$

Apply the Sum Rule: $\int f(x) \pm g(x) dx = \int f(x) dx \pm \int g(x) dx$

$$= \int_1^2 x^2 dx - \int_1^2 2x dx$$

$$\int_1^2 x^2 dx = \frac{7}{3}$$

$$\int_1^2 2x dx = 3$$

$$= \frac{7}{3} - 3$$

Simplify $\frac{7}{3} - 3$: $-\frac{2}{3}$

$$= -\frac{2}{3}$$

$$\int 4xe^{x^2}dx$$

Take the constant out: $\int a \cdot f(x)dx = a \cdot \int f(x)dx$

$$= 4 \cdot \int xe^{x^2}dx$$

Apply u – substitution: $u = x^2$

$$= 4 \cdot \int \frac{e^u}{2}du$$

Take the constant out: $\int a \cdot f(x)dx = a \cdot \int f(x)dx$

$$= 4 \cdot \frac{1}{2} \cdot \int e^u du$$

Use the common integral: $\int e^u du = e^u$

$$= 4 \cdot \frac{1}{2}e^u$$

Substitute back $u = x^2$

$$= 4 \cdot \frac{1}{2}e^{x^2}$$

Simplify $4 \cdot \frac{1}{2}e^{x^2}$: $2e^{x^2}$

$$= 2e^{x^2}$$

Add a constant to the solution

$$= 2e^{x^2} + C$$