

Answer on Question #79980 – Math – Calculus

Question

$$\int (x + 2)\sqrt{x + 1} dx$$

Solution

$$\int (x + 2)\sqrt{x + 1} dx$$

Use a formula for integration by parts (partial integration)

$$\int u dv = uv - \int v du$$

For this equation:

$$u = x + 2$$

$$dv = \sqrt{x + 1} dx = (x + 1)^{\frac{1}{2}} dx$$

$$du = dx$$

$$v = \frac{2}{3} (x + 1)^{\frac{3}{2}}$$

As a result,

$$\begin{aligned} \int (x + 2)\sqrt{x + 1} dx &= (x + 2) * \frac{2}{3} (x + 1)^{\frac{3}{2}} - \int \frac{2}{3} (x + 1)^{\frac{3}{2}} dx \\ &= \frac{2}{3} (x + 2)(x + 1)^{\frac{3}{2}} - \frac{2}{3} * \frac{2}{5} (x + 1)^{\frac{5}{2}} + const \\ &= (x + 1)^{\frac{3}{2}} * \left(\frac{2}{3} (x + 2) - \frac{4}{15} (x + 1) \right) + const \\ &= (x + 1)^{\frac{3}{2}} \left(\frac{6}{15} x + \frac{16}{15} \right) + const = \frac{2}{15} (x + 1)^{\frac{3}{2}} (3x + 8) + const \end{aligned}$$

$$\int (x + 2)\sqrt{x + 1} dx = \frac{2}{15} (x + 1)^{\frac{3}{2}} (3x + 8) + const,$$

where *const* is an integration constant.

Answer:

$$\int (x + 2)\sqrt{x + 1} dx = \frac{2}{15} (x + 1)^{\frac{3}{2}} (3x + 8) + \text{const}$$