**Answer on Question #53130 – Math – Integral Calculus**

Find the reduction formula of ∫sin10xdx.

**Solution**

$$I_n = \int sin^n x dx = \int sin^{n-1} x sinx dx = -\int sin^{n-1} x d(cosx) =$$

$$= -sin^{n-1}xcosx + (n-1)\int sin^{n-2}xcos^2xdx =$$

$$= -sin^{n-1}xcosx + (n-1)\int sin^{n-2}x(1 - sin^2x)dx =$$

$$= -sin^{n-2}xcosx + (n-1)I_{n-2} - (n-1)I_n \rightarrow$$

$$\rightarrow \quad I_n = -\frac{1}{n}sin^{n-1}xcosx + \frac{n-1}{n}I_{n-2}$$

**Thus**

$$I_{10} = -\frac{1}{10}sin^9xcosx + \frac{9}{10}I_8 =$$

$$= -\frac{1}{10}sin^9xcosx + \frac{9}{10}\left(-\frac{1}{8}sin^7xcosx + \frac{7}{8}I_6\right) =$$

$$= -\frac{1}{10}sin^9xcosx - \frac{9}{80}sin^7xcosx + \frac{63}{80}\left(-\frac{1}{6}sin^5xcosx + \frac{5}{6}I_4\right) =$$

$$= -\frac{1}{10}sin^9xcosx - \frac{9}{80}sin^7xcosx - \frac{63}{480}sin^5xcosx + \frac{315}{480}\left(-\frac{1}{4}sin^3xcosx + \frac{3}{4}I_2\right) =$$

$$= -\frac{1}{10}sin^9xcosx - \frac{9}{80}sin^7xcosx - \frac{63}{480}sin^5xcosx - \frac{315}{1920}sin^3xcosx +$$

$$+\frac{945}{1920}\left(-\frac{1}{2}sinxcosx + \frac{1}{2}I_0\right) =$$

$$= -\frac{1}{10}sin^9xcosx - \frac{9}{80}sin^7xcosx - \frac{21}{160}sin^5xcosx - \frac{105}{640}sin^3xcosx -$$

$$-\frac{315}{1280}sinxcosx + \frac{315}{1280}I_0$$

**But** $I_0 = \int dx = x + c$**, where** ***c*** **is an arbitrary real constant.**

**So**

$$\int \boldsymbol{sin^{10}xdx} =$$

$$= -\frac{sin2x}{2560}\left(256sin^8x + 144sin^6x + 168sin^4x + 210sin^2x + 315\right) + \frac{315}{2560}x + c$$