

$$\int_0^{\infty} r e^{-\frac{2r}{a}} \sin kr \, dr$$

$$= \left[ \sin kr \left\{ \int_0^{\infty} r e^{-\frac{2r}{a}} \, dr \right\} \right]_0^{\infty} - \left[ k \cos kr \left\{ \int_0^{\infty} r e^{-\frac{2r}{a}} \, dr \right\} \right]_0^{\infty}$$

obtain

$$\left( r e^{-\frac{2r}{a}} \right)' = e^{-\frac{2r}{a}} - \frac{2}{a} r e^{-\frac{2r}{a}}$$

$$r e^{-\frac{2r}{a}} = \frac{a}{2} e^{-\frac{2r}{a}} - \frac{a}{2} \left( r e^{-\frac{2r}{a}} \right)'$$

integrate both sides  $r=0$  to  $\infty$

put back

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