$$y(t) = \frac{1}{\pi}\int_0^t \frac{1+2s}{(t-s)^{\frac{1}{2}}}\,ds$$

$$= \frac{1}{\pi}\int_0^t \frac{ds}{(t-s)^{\frac{1}{2}}} + \frac{1}{\pi}\int_0^t \frac{2s}{(t-s)^{\frac{1}{2}}}\,ds$$

sub $s = t\sin^2\theta$, $ds = \cancel{t}2\sin\theta\cos\theta\,d\theta$

$$= \frac{1}{\pi}\int_0^{\pi/2} \frac{t\,2\sin\theta\cos\theta\,d\theta}{t^{1/2}\sin\theta} + \frac{1}{\pi}\int_0^{\pi/2} \frac{4t^2\sin^3\theta\cos\theta\,d\theta}{t^{1/2}\cos\theta}$$

$$= \frac{1}{\pi}\int_0^{\pi/2} 2t^{1/2}\cos\theta\,d\theta + \frac{1}{\pi}\int_0^{\pi/2} 4t^{3/2}\sin^3\theta\,d\theta$$

$$= \frac{2t^{\frac{1}{2}}}{\pi} + \frac{4t^{3/2}}{\pi}\int_0^{\pi/2}\sin^3\theta\,d\theta$$

$$= \frac{2t^{\frac{1}{2}}}{\pi} + \frac{4t^{3/2}}{\pi}\int_0^{\frac{\pi}{2}} \frac{3}{4}\sin\theta - \frac{1}{4}\sin 3\theta\,d\theta$$

$$= \frac{2t^{\frac{1}{2}}}{\pi} + \frac{4t^{3/2}}{\pi}\left[\frac{-3}{4}\cos\theta + \frac{1}{12}\cos 3\theta\right]_0^{\pi/2}$$

$$= \frac{2t^{\frac{1}{2}}}{\pi} + \frac{4t^{3/2}}{\pi}\left[0 + \frac{3}{4} + 0 - \frac{1}{12}\right]$$

$$= \frac{2t^{\frac{1}{2}}}{\pi} + \frac{8t^{3/2}}{3\pi}$$ ✓ as req.

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Again, using $s = tx$ and the Note saves having to work out these integrals in detail.