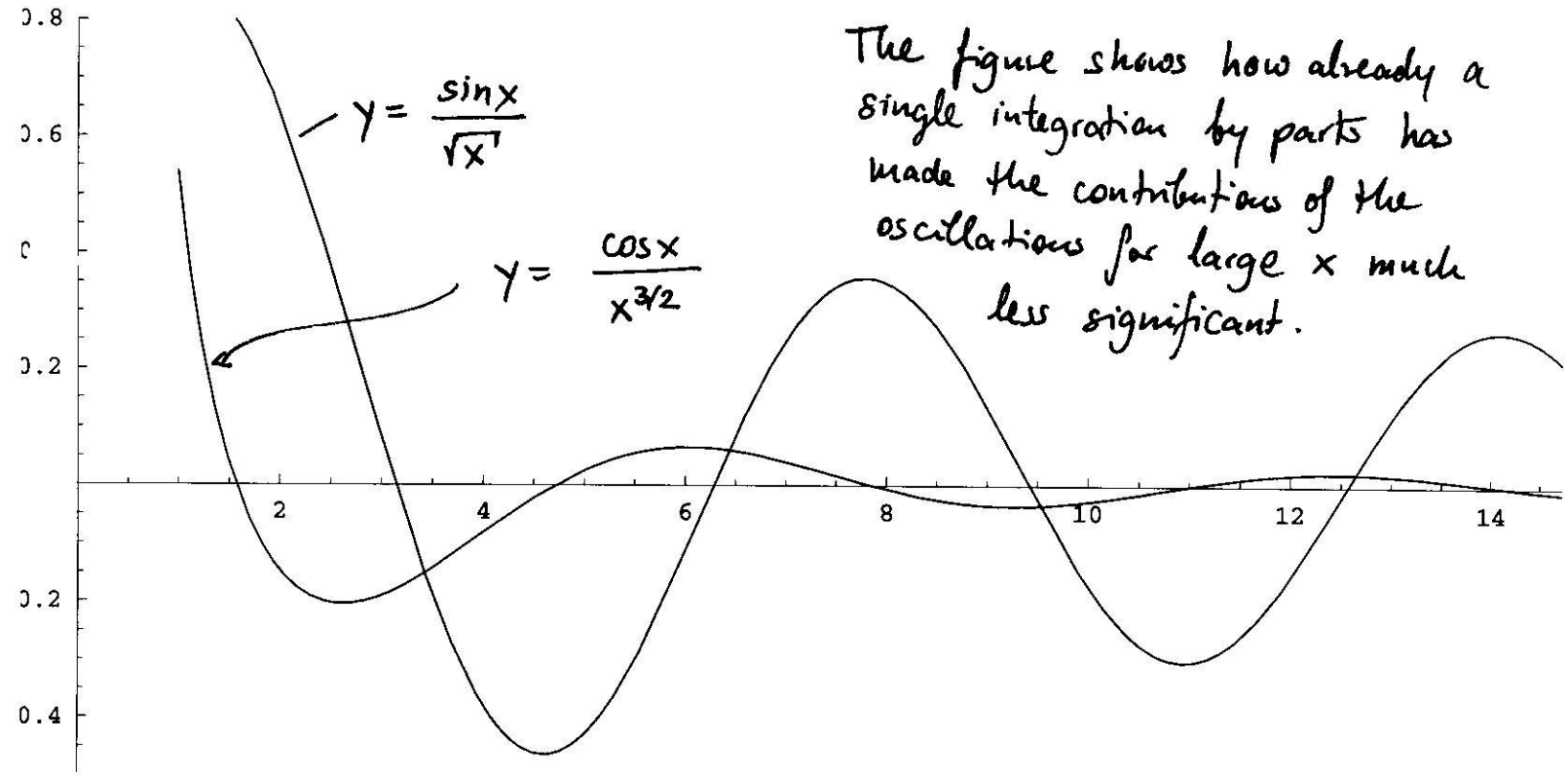
#42:

$$\int_1^{100} x^{-\frac{1}{2}} \sin x \, dx = \left[-x^{-\frac{1}{2}} \cos x\right]_1^{100} - \int_1^{100} \frac{1}{2} x^{-3/2} \cos x \, dx$$

($x^{-\frac{1}{2}}$: $-\frac{1}{2}x^{-\frac{3}{2}}$; $\sin x$: $-\cos x$; $\frac{1}{2}x^{-3/2}$: $-\frac{3}{4}x^{-5/2}$; $\cos x$: $\sin x$)

$$= \left[-x^{-1/2}\cos x - \frac{1}{2}x^{-3/2}\sin x\right]_1^{100} - \frac{3}{4}\int_1^{100} x^{-5/2}\sin x \, dx$$

For large x, the oscillations in $x^{-5/2}\sin x$ have much smaller amplitude than in $x^{-1/2}\sin x$



The figure shows how already a single integration by parts has made the contributions of the oscillations for large x much less significant.