Remaining Part of Q6 lecture 2

$$\frac{-1}{2}\left[\frac{4t+12}{2t^2-3t-2}\right]dt = \frac{1}{4}du$$

$$\frac{-1}{2}\left[\frac{4t-3}{2t^2-3t-2} + \frac{15}{2t^2-3t-2}\right]dt = \frac{1}{4}du \quad \text{--- (c)}$$

Now consider

$$\frac{15}{2t^2-3t-2} = \frac{15}{2(t^2-\frac{3}{2}t-1)}$$

$$= \frac{15}{2}\left[\frac{1}{t^2-2(\frac{3}{4})(t)+\frac{9}{16}-\frac{9}{16}-1}\right]$$

$$= \frac{15}{2}\left[\frac{1}{\left(t-\frac{3}{4}\right)^2-\frac{25}{16}}\right]$$

$$= \frac{15}{2}\left[\frac{1}{\left(t-\frac{3}{4}-\frac{5}{4}\right)\left(t-\frac{3}{4}+\frac{5}{4}\right)}\right]$$

$$= \frac{15}{2}\left[\frac{1}{(t-2)(t+\frac{1}{2})}\right]$$

$$= \frac{15}{2}\left[\frac{2}{5(t-2)} - \frac{2}{5(t+\frac{1}{2})}\right]$$

so Eq^n (c) =>

$$-\frac{1}{2}\left[\frac{4t-3}{2t^2-3t-2} + \frac{\cancel{15}^{3}}{\cancel{2}}\times\frac{\cancel{2}}{\cancel{5}(t-2)} - \frac{\cancel{15}^{3}}{\cancel{2}}\times\frac{\cancel{2}}{\cancel{5}(t+\frac{1}{2})}\right]dt = \frac{1}{4}du$$

$$-\frac{1}{2}\left[\frac{4t-3}{2t^2-3t-2} + \frac{3}{t-2} - \frac{3}{t+\frac{1}{2}}\right]dt = \frac{1}{4}du.$$

Integrate

$$-\frac{1}{2}\left[\ln(2t^2-3t-2)+3\ln(t-2)-3\ln\left(t+\frac{1}{2}\right)\right]=\ln u+c$$

for back substitution

$$t=\frac{v}{u} \Rightarrow \frac{y-2}{x-1}$$

so,

$$-\frac{1}{2}\left[\ln\left\{2\left(\frac{y-2}{x-1}\right)^2-3\left(\frac{y-2}{x-1}\right)-2\right\}+3\ln\left(\frac{y-2}{x-1}-2\right)\right.$$

$$\left.-3\ln\left(\frac{y-2}{x-1}+\frac{1}{2}\right)\right]=\ln(x-1)+c$$

Ans.