Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary) and using equal signs and arrows when appropriate. Box final short answers.

a) For the curve $C_1$ use $x = t$ as a parameter. Write down $\mathbf{F}(t) = \langle x(t), y(t) \rangle$ and the corresponding interval $a \leq t \leq b$. Express $\int_{C_1} \mathbf{F} \cdot d\mathbf{r}$ as a definite integral in $t$ and then evaluate it. You may use MAPLE.

b) For the curve $C_2$ use the polar angle $\theta = t$ as a parameter. Write down $\mathbf{F}(t) = \langle x(t), y(t) \rangle$ and the corresponding interval $C_2 t \in [0, \pi]$. Express $\int_{C_2} \mathbf{F} \cdot d\mathbf{r}$ as a definite integral in $t$ and then evaluate it. You may use MAPLE (or your calculator).

c) Combine the two results to obtain the closed loop $C = C_1 + C_2$ line integral $\int_C \mathbf{F} \cdot d\mathbf{r} = \int_{C_1} \mathbf{F} \cdot d\mathbf{r} + \int_{C_2} \mathbf{F} \cdot d\mathbf{r}$.

da) Set up and evaluate a double integral whose value by Green's Thm should agree with part C). You may use MAPLE to evaluate it. Do they agree?

a) $C_1: \quad x + y = 2 \rightarrow y = 2 - x \quad \mathbf{F} = \langle x, y \rangle = \langle t, 2 - t \rangle, \quad t = 0 \ldots 2$

$\mathbf{F}' = \langle 1, -1 \rangle, \quad \mathbf{F} = \langle t(2-t), t^2 \rangle, \quad \mathbf{F} \cdot \mathbf{F}' = t(2-t) - t^2 = 2t - 2t^2$

$\int_{C_1} \mathbf{F} \cdot d\mathbf{r} = \int_0^2 (2t - 2t^2) \, dt = \frac{-4}{3}

b) $C_2: \quad x^2 + y^2 = 4 \rightarrow r^2 = 4 \rightarrow r = 2 \quad \mathbf{F} = \langle x, y \rangle = \langle \cos \theta, \sin \theta \rangle = \langle 2 \cos t, 2 \sin t \rangle$

$\mathbf{F}' = \langle -2 \sin t \cos t + 8 \cos^3 t \rangle \quad \mathbf{F} = \langle 2 \cos t \rangle, \quad \mathbf{F}^2 = \langle \cos^2 t \rangle$

$\int_{C_2} \mathbf{F} \cdot d\mathbf{r} = \frac{8}{3}$

$\int_0^{2\pi} \left[ -8 \sin^2 t \cos t + 8 \cos^3 t \right] \, dt = \frac{8}{3} \left[ 1 + 0 + 2 - 0 \right] = \frac{8}{3}$

c) $\int_C \mathbf{F} \cdot d\mathbf{r} = -\frac{4}{3} + \frac{8}{3} = \frac{4}{3}$