

Section 4.2.

2. $(1, 3t^2, t^3)$ for $0 \leq t \leq 1$.

$$\vec{c}'(t) = (0, 6t, 3t^2).$$

$$\begin{aligned} L(\vec{c}) &= \int_0^1 \sqrt{36t^2 + 9t^4} dt \\ &= \int_0^1 3t \sqrt{4 + t^2} dt = \frac{3}{2} \int_0^1 \sqrt{t^2 + 4} d(t^2 + 4) \\ &= \frac{3}{2} \left[\frac{1}{\frac{3}{2}} (t^2 + 4)^{\frac{3}{2}} \right]_0^1 \\ &= 5^{\frac{3}{2}} - 8. \end{aligned}$$

Rubric: 3 points for correct expression of $L(\vec{c})$
2 points for doing integral.

10. $(\log \sqrt{t}, \sqrt{3}t, \frac{3}{2}t^2)$ for $1 \leq t \leq 2$

$$\vec{c}(t) = \left(\frac{1}{2} \log t, \sqrt{3}t, \frac{3}{2}t^2 \right) \quad \vec{c}'(t) = \left(\frac{1}{2t}, \sqrt{3}, 3t \right)$$

$$\begin{aligned} L(\vec{c}) &= \int_1^2 \sqrt{\frac{1}{4t^2} + 3 + 9t^2} dt. \\ &= \int_1^2 \sqrt{\left(\frac{1}{2t} + 3t\right)^2} dt = \int_1^2 \left(\frac{1}{2t} + 3t\right) dt. \\ &= \left[\frac{1}{2} (\log t + \frac{3}{2}t^2) \right]_1^2 \\ &= \frac{1}{2} \log 2 + 6 - \frac{3}{2}. \end{aligned}$$

Rubric: 3 points for correct expression of $L(\vec{c})$
2 points for the correct answer.

$$8. \vec{c}(t) = (Rt - R \sin t, R - R \cos t).$$

$$\vec{c}'(t) = (R - R \cos t, R \sin t).$$

$$L(\vec{c}) = \int_0^{2\pi} \sqrt{R^2 + R^2 \cos^2 t - 2R^2 \cos t + R^2 \sin^2 t} dt.$$

$$= \int_0^{2\pi} \sqrt{R^2 - 2R^2 \cos t + R^2} dt.$$

$$= \int_0^{2\pi} \sqrt{2} R \cdot \sqrt{1 - \cos t} dt.$$

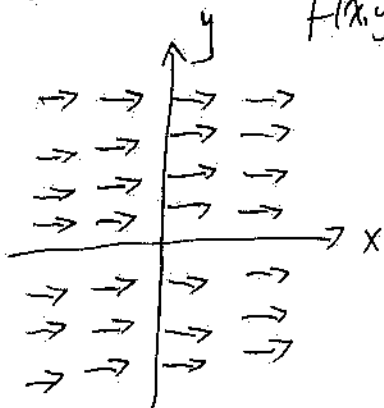
$$= \int_0^{2\pi} \sqrt{2} R \cdot \sqrt{2} \sqrt{\sin^2 \frac{t}{2}} dt.$$

$$= \int_0^{2\pi} 2R |\sin \frac{t}{2}| dt = 8R.$$

Rubric: 3 pts for the expression of $L(\vec{c})$
2 pts for answer.

Section 4.3.

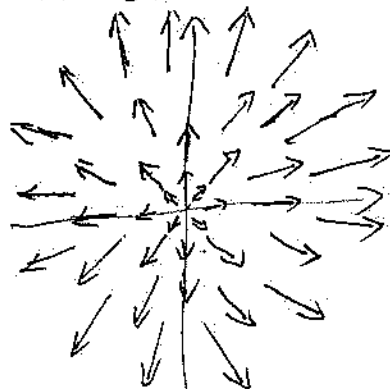
2.



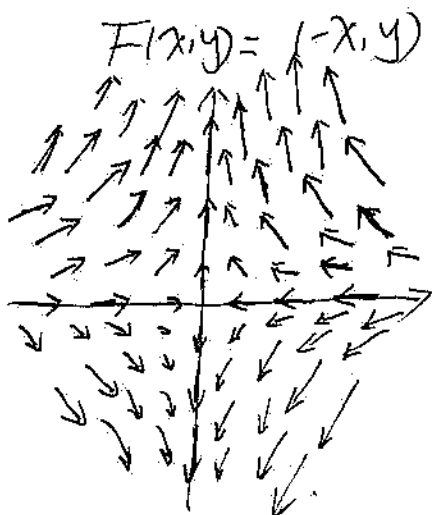
$$F(x,y) = (4,0)$$

3.

$$F(x,y) = (x,y)$$



4.



$$F(x,y) = (-x,y)$$

Rubric 5 pts each for 2, 3, 4.