17.1

2:

$$\begin{pmatrix} x(t) \\ y(t) \end{pmatrix} = 2\begin{pmatrix} \cos(t) \\ \sin(t) \end{pmatrix} \qquad 0 \leq t \leq \pi/2$$

10:

$$\begin{pmatrix} x(t) \\ y(t) \\ z(t) \end{pmatrix} = \begin{pmatrix} 5 \\ 5t-1 \\ 2t+1 \end{pmatrix}$$

22:

$$\begin{pmatrix} x(t) \\ y(t) \\ z(t) \end{pmatrix} = \begin{pmatrix} 2\cos(t) \\ 2\sin(t) \\ 1 \end{pmatrix}$$

40:

$$\begin{pmatrix} x(t) \\ y(t) \end{pmatrix} = \begin{pmatrix} t^2 \\ t \end{pmatrix} \qquad 1 \leq t \leq 8$$

44:

$$\begin{pmatrix} x(t) \\ y(t) \\ z(t) \end{pmatrix} = \begin{pmatrix} t \\ 5\cos(t) \\ 5\sin(t) \end{pmatrix}$$

64: L_1 and L_2 are the same line.

17.2

2:

$$\vec{v}(t) = \begin{pmatrix} 6t \\ 2t \\ -2t \end{pmatrix}$$

$$\vec{a}(t) = \begin{pmatrix} 6 \\ 2 \\ -2 \end{pmatrix}$$

8:

$$\vec{v}(t) = \begin{pmatrix} -3\sin(3t) \\ 5\cos(5t) \end{pmatrix}$$

$$\|\vec{v}(t)\| = \sqrt{9\sin^2(3t) + 25\cos^2(5t)}$$

12:

$$\vec{v}(t) = \begin{pmatrix} 3\sin(2t) \\ -\sin(t) \\ 2t \end{pmatrix}$$
$$\|\vec{v}(t)\| = \sqrt{9\sin^2(2t) + \sin^2(t) + 4t^2}$$

14:

$$\int_0^{2\pi} \sqrt{9\sin^2(3t) + 25\cos^2(5t)}dt \approx 24.603$$

20:

$$\vec{v}(t) = \begin{pmatrix} -6t^2 - 3 \\ 12t^2 + 6 \\ 18t^2 + 9 \end{pmatrix}$$
$$\vec{a}(t) = \begin{pmatrix} -12t \\ 24t \\ 36t \end{pmatrix}$$

24:

$$\vec{v}(t) = \begin{pmatrix} 3t^2 - 12 \\ 2t + 10 \end{pmatrix}$$

so when $t = \pm 2$, the particle is moving parallel to the x-axis, and when $t = -5$, the particle is moving parallel to the y-axis. As $t \to +\infty$, $x, y \to +\infty$, while as $t \to -\infty$, $x \to -\infty$ and $y \to +\infty$

28: (a)

$$\begin{aligned} (1+t) + (5+2t) + (-7+t) &= 1 \\ 4t - 1 &= 1 \\ t &= \frac{1}{2} \\ \begin{pmatrix} x \\ y \\ t \end{pmatrix} &= \begin{pmatrix} \frac{3}{2} \\ 6 \\ \frac{13}{2} \end{pmatrix} \end{aligned}$$

(b)

$$\begin{aligned} \|\vec{v}\| &= \sqrt{1+4+1} \\ &= \sqrt{6} \text{ m/s} \end{aligned}$$

44: I don't know how to do this problem.

17.3

2:

$$\vec{F}(x, y) = \begin{pmatrix} -y \\ 0 \end{pmatrix}$$

4:

$$\vec{F}(x,y) = \begin{pmatrix} -y \\ x \end{pmatrix}$$

6:

$$\vec{F}(x,y) = \begin{pmatrix} x \\ y \end{pmatrix}$$

8: The vector field is neither parallel to the x-axis nor the y-axis. As x increases, the length remains constant, while as y increases, the length also increases.

10: The vector field is neither parallel to the x-axis nor the y-axis. As x increases and as y increases, the length also increases.

24:

$$\vec{F}(x,y) = \begin{pmatrix} y \\ y \end{pmatrix}$$

26:

$$\vec{F}(x,y) = \begin{pmatrix} x \\ y \end{pmatrix}$$

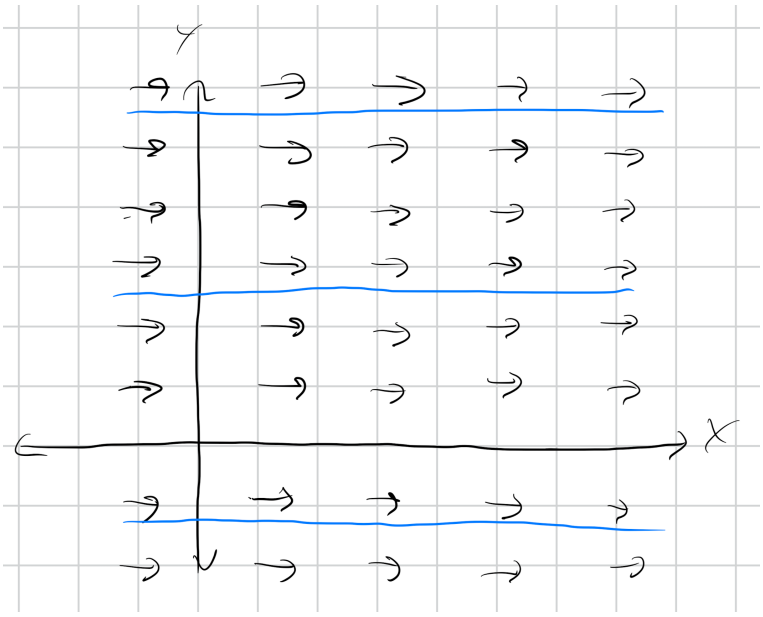
28: (I) (C)
(II) (B)
(III) (A)
(IV) (D)

32:

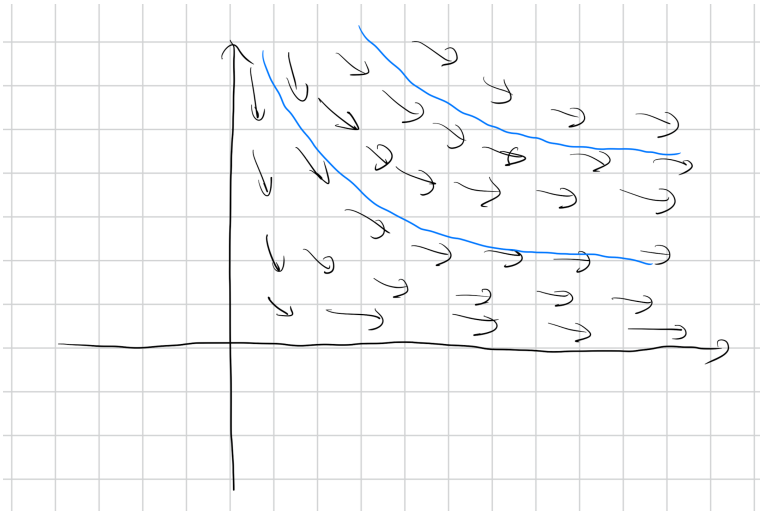
$$\vec{F}(x,y) = \begin{pmatrix} x \\ 0 \end{pmatrix}$$

17.4

2:



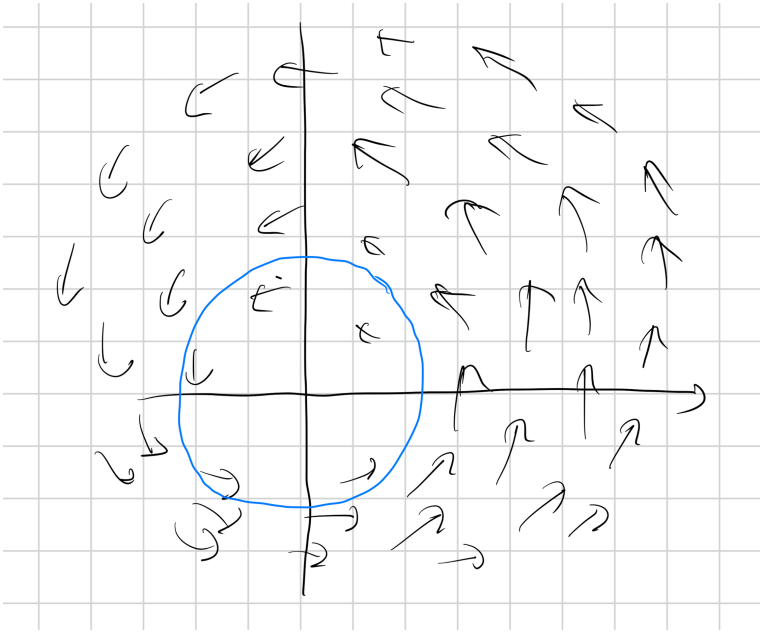
6:



$$\begin{pmatrix} x'(t) \\ y'(t) \end{pmatrix} = \begin{pmatrix} x \\ -y \end{pmatrix}$$

$$x'(t) = x(t)$$
$$y'(t) = -y(t)$$
$$x'(t) = x_0 e^{t}$$
$$y'(t) = y_0 e^{-t}$$

8:



16:

(a) (III)
(b) (I)
(c) (II)
(d) (V)
(e) (VI)
(f) (IV)

20:

$$\begin{pmatrix} x'(t) \\ y'(t) \end{pmatrix} = \begin{pmatrix} x \\ -y \end{pmatrix}$$

$$\nabla f = \begin{pmatrix} 2x \\ -2y \end{pmatrix}$$

$$\begin{pmatrix} x'(t) \\ y'(t) \end{pmatrix} = \frac{1}{2}\nabla f$$