Sketch the image of the following path, using arrows to indicate the direction in which the parameter increases:

$$\begin{cases} x = t\cos t \\ y = t\sin t \end{cases}, \quad -6\pi \le t \le 6\pi$$

Calculate the velocity, speed, and acceleration of the given path.

$$\mathbf{x}(t) = (e^t, e^{2t}, 2e^t)$$

Find an equation for the line tangent to the given path at the indicated value for the parameter.

$$\mathbf{x}(t) = (t^2, t^3, t^5), t = 2$$

Calculate the length of the given path.

$$\mathbf{x}(t) = (2t + 1, 7 - 3t), -1 \leq t \leq 2$$

Calculate the length of the given path.

$$\mathbf{x}(t) = 7\mathbf{i} + t\mathbf{j} + t^2\mathbf{k}, 1 \leq t \leq 3$$

This problem concerns the path

$$\mathbf{x} = |t-1|\mathbf{i} + |t|\mathbf{j}, \quad -2 \le t \le 2$$

(1) Sketch this path.

(2) The path fails to be of class C^1 but is piecewise C^1. Explain.

(3) Calculate the length of the path.

Sketch the given vector field on $\mathbb{R}^3$. *Note:* describe in addition to sketch.

$$\mathbf{F} = (0, z, -y)$$

Verify that the path given is a flow line of the indicated vector field. Justify the result geometrically with an appropriate sketch.

$$\mathbf{x}(t) = (\sin t, \cos t, 2t), \mathbf{F} = (y, -x, 2)$$

Calculate the flow line $\mathbf{x}(t)$ of the given vector field $\mathbf{F}$ that passes through the indicated point at the specified value of t.

$$\mathbf{F}(x, y) = -x\mathbf{i} + y\mathbf{j}; \quad \mathbf{x}(0) = (2, 1)$$