

5. LINE: $4x - y = 2$ point (x_0, y_0) $(3, 5)$

$$D = (x - x_0)^2 + (y - y_0)^2$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$f = (x - 3)^2 + (y - 5)^2$$

$$4x - y = 2$$

① $\frac{4x - y - 2}{g} = 0$

② $\nabla f = f_x \vec{i} + f_y \vec{j}$

$$\nabla g = g_x \vec{i} + g_y \vec{j}$$

$$\nabla f = 2(x - 3) \vec{i} + 2(y - 5) \vec{j}$$

$$\nabla g = 4 \vec{i} - \vec{j}$$

③ $\nabla f = \lambda \nabla g$

$$2(x - 3) \vec{i} + 2(y - 5) \vec{j} = \lambda(4 \vec{i} - \vec{j})$$

$$2(x - 3) \vec{i} + 2(y - 5) \vec{j} = 4\lambda \vec{i} - \lambda \vec{j}$$

$$2(x - 3) = 4\lambda \quad 2(y - 5) = -\lambda$$

$$x - 3 = 2\lambda \quad y - 5 = -\frac{1}{2}\lambda$$

$$x = 2\lambda + 3 \quad y = -\frac{1}{2}\lambda + 5$$

$$4x - y = 2$$

$$4(2\lambda + 3) - (-\frac{1}{2}\lambda + 5) = 2$$

$$8\lambda + 12 + \frac{1}{2}\lambda - 5 = 2$$

$$8\lambda + \frac{1}{2}\lambda + 7 = 2$$

$$8\lambda + \frac{1}{2}\lambda = 2 - 7$$

$$8\lambda + \frac{1}{2}\lambda = -5$$

$$16\lambda + \lambda = -10$$

$$17\lambda = -10$$

$$\lambda = \frac{-10}{17}$$

$$x = 2\lambda + 3 \quad y = -\frac{1}{2}\lambda + 5$$

$$x = 2\left(\frac{-10}{17}\right) + 3 \quad y = -\frac{1}{2}\left(\frac{-10}{17}\right) + 5$$

$$x = \frac{-20}{17} + \frac{51}{17} \quad y = \frac{5}{17} + 5$$

$$x = \frac{31}{17} \quad y = \frac{90}{17}$$

$(3, 5)$

$$d = \sqrt{\left(\frac{31}{17} - 3\right)^2 + \left(\frac{90}{17} - 5\right)^2}$$

$$d = \sqrt{\frac{25}{17}}$$

$$d = \frac{\sqrt{25}}{\sqrt{17}}$$

$$d = \frac{5}{\sqrt{17}}$$

$$d = \frac{5\sqrt{17}}{17}$$