Parabola: set of all points in a plane that are equidistant from a fixed focal point and the directrix line

\[ d_1 = d_2 \quad \rho = \text{distance from vertex to focus} \]

\[ F \quad y = \frac{1}{4\rho} x^2 \]

\[ V \quad (0, 0) \quad \text{directrix} \quad y = -\rho \]

\[ x = \frac{1}{4\rho} y^2 \quad x = -\frac{1}{4\rho} y^2 \]

From equation, find focus & directrix & graph.

\[ x = 0 - \frac{1}{8} y^2 + 1 \]

\[ x = -y^2 \quad \text{no translation vertically, but} \]

\[ +1 \text{ to right for } x = -y^2 \]

\[ x = 3 \text{ (directrix)} \]
from equation, find vertex, focus & directrix & graph

$6x - x^2 = 8y + 1$

$-x^2 + 6x - 1 = 8y$

$- (x^2 - 6x + 9) - 8 = 8y$

$- \frac{1}{8} (x - 3)^2 + 8 = 8y$

$\frac{1}{4p} = \frac{1}{8}$

$V(3, 1) \quad p = 2$

opens down $F(3, -1)$ $y = 3$ directrix

from info, write equation

$p = \frac{1}{2}$

$F(-1, 3)$

$(-1, 3) F \cdot \left( -\frac{1}{2}, 3 \right)$

$(x - h)^2 = -\frac{1}{4p} (y - k)^2$

$X + \frac{1}{2} = -\frac{1}{4(\frac{1}{2})} (y - 3)^2$

$X + \frac{1}{2} = -\frac{1}{2} (y - 3)^2$

$X = -\frac{1}{2} (y - 3)^2 - \frac{1}{2}$

$-\frac{1}{2} (y^2 - 6y + 9) - \frac{1}{2}$

$-\frac{1}{2} y^2 + 3y - \frac{9}{2} - \frac{1}{2}$

$= -\frac{1}{2} y^2 + 3y - 5$