10.6 Polar Equations of Conics -

Theorem 10.17: Polar Equations of Conics

The graph of a polar equation of the form

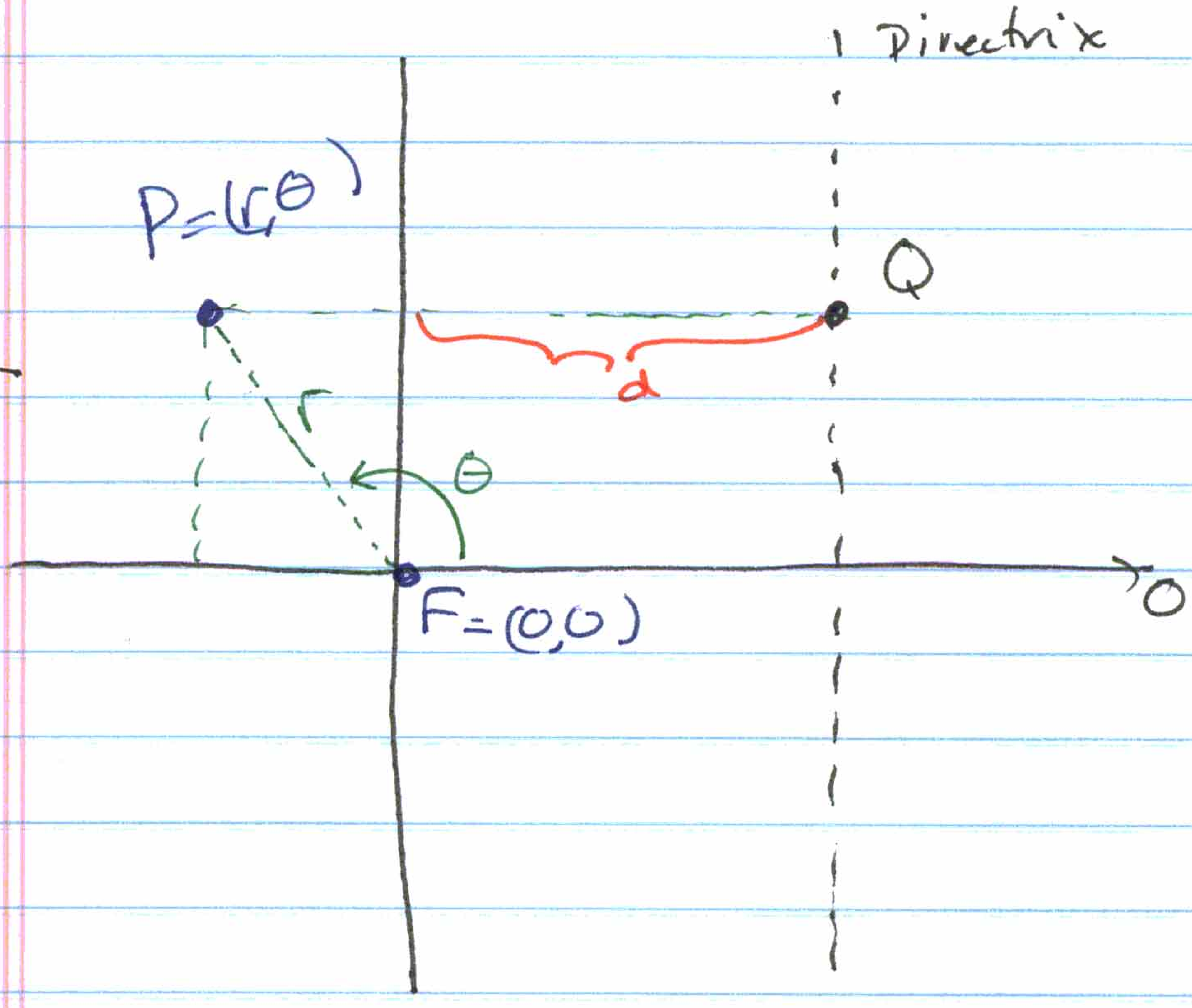
$$r = \frac{ed}{1 \pm e\cos\theta} \quad \text{or} \quad r = \frac{ed}{1 \pm e\sin\theta}$$

is a conic, where $e > 0$ is the eccentricity, and $|d|$ is the distance between the focus at the pole and its corresponding directrix

$0 < e < 1$ ellipse

$e = 1$ parabola

$e > 1$ hyperbola



$$\frac{16^2x^2}{20^2} + \frac{16^2(y+\frac{15}{16})^2}{25^2} = 1$$

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Graph:

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$$r = \frac{\frac{1}{5}(5)}{\frac{1}{5}[5+3\sin\theta]} = \frac{1}{1+\frac{3}{5}\sin\theta}$$

Ellipse

$e = \frac{3}{5}$, $de = 1$, $d = \frac{5}{3}$

$\frac{de}{e} = \frac{1}{e}$

Graph:

$$\frac{(x-\frac{8}{3})^2}{\frac{16}{9}} - \frac{y^2}{\frac{48}{9}} = 1$$

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Graph:

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$$r = \frac{4}{1+2\cos\theta}$$

$de = 4$, $e = 2$ ← hyperbola

$$\frac{de}{e} = \frac{4}{e}$$

$d = 2$