We discussed the portion of YESTERDAYS notes which I did after class and which completed the derivation of the NSF (New Standard Form) of the vertical parabola, \( x^2 = 4py \).

### Examples of Vertical parabolas

**A** \( x^2 = 4py \)

- If \( p > 0 \), then the parabola opens upward.
- If \( p < 0 \), then the parabola opens downward.

**B** \( x^2 = 8y \). Find \( F \), directrix \( \ell \), and Graph.

**Solution**

1. In NSF, \( 4p = 8 \), \( p = 2 \).

2. \( p > 0 \) \( \Rightarrow \) parabola opens up.

3. \( F(0, 2) \) is the focus and \( y = -2 \) is the equation of the directrix.

4. Graph.
C. \[ 2x + 10y = 0 \] Find \( F \) & dir.

Soln.

1. \[ x^2 = -10y \] NSF

2. \[ 4p = -10 \Rightarrow p = \frac{-5}{2} \quad (p < 0) \]

3. \[ \text{Opens down} \quad \therefore F(0, -\frac{5}{2}) \quad \text{Eq. of directrix is } y = \frac{5}{2} \]

4. \[ \text{Parabolas that open right } (p > 0) \text{ or left } (p < 0) \]

NSF \[ y^2 = 4px \]

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D. \[ 2x - y^2 = 0 \] Find \( F \) & eq. of dir.

Soln.

1. \[ 2x = y^2 \quad \text{NSF.} \]

2. \[ \therefore \text{Parab opens} \Rightarrow \text{ (open to the right)} \]

3. \[ 4p = 2 \therefore p = \frac{1}{2} \]

4. \[ \therefore F(\frac{1}{2}, 0) \quad \text{and } x = -\frac{1}{2} \text{ is the eq. of the directrix} \]

If you get the x and y coordinates “mixed-up” and write \( F(0, \frac{1}{2}) \) for this problem, then you are indicating a parabola with its focus on the y-axis! (which opens upward!)

Whoops!