Several students have requested the following problems. — GOOD LUCK to ALL!

1. [§10.1: p. 751: # 33]
   Find the eqn. of the parabola w/ Focus on pos x-axis, 2 units away from the directrix. (Vertex @ origin).

   **Solution:**
   - Focus on pos x-axis. **Parabola** opens to the right. **"Form"** of the eqn. is \( y^2 = 4px \) w/ \( p > 0 \). \( F(p, 0) \). Also, directrix is \( x = -p \). Now, the distance between \( F \) and the directrix is \( 2p \) units. (\( p \) units from \( F \) to \( O \) and \( p \) units from \( O \) to \( x = -p \)). But this distance is "given" in the problem as 2. \( \therefore p = 1 \)
   - The eqn. is \( y^2 = 4x \).

2. [§10.1: p. 751: # 41]
   You must see the drawing in the book. It shows a parabola opening to the left (w/Vertex @ \( O \)) and the length of the l.t. = 3 (2/3 "over" the focus and 2/3 "under."). It says on p. 748 that the focal diameter (i.e., the length of the l.t.) is \( 14p \). \( \therefore 14p = 3 \)
   Now the parabola opens left, so \( y^2 = -4px \) or, I should say, \( y^2 = 4px \) w/ \( p < 0 \).
   \( \therefore \) The eqn. is \( y^2 = -3x \).

3. [§10.1: p. 752: # 49]
   I'm not going to re-draw the figure of the parabolic reflector — You'll just have to look in the book!
   The vertex is at \( O(0, 0) \), and the \( fD = 12 \) cm (focal diameter). The focus is on the pos x-axis, and the distance from the vertex to the "mouth" of the reflector (i.e., the depth of the bowl) is 20 cm.
   - Find eq. of parab.
   - What is the width of the mouth?

   **Solution:**
   - \( fD = 12 \) (given), \( fD = 4p | \text{ Act.} \)
   - \( p > 0 \) since parab. opens right. \( \therefore fD = 4p = 12 \)
   - \( y^2 = 4px \leftarrow w/p > 0 \) is the "form" which opens right. \( \therefore y^2 = 12x \)

4. To solve part (b), plug 20 in for \( x \):
   \( y^2 = 12(20) = 240 \). \( \therefore y = \pm \sqrt{240} \)
   So the line \( x = 20 \) intersects the parabola at \( (20, \sqrt{240}) \) and \( (20, -\sqrt{240}) \). So the width of the parabola @ its "mouth" is \( 2\sqrt{240} = 2\sqrt{16 \cdot 15} = 8\sqrt{15} \) cm.
The 10-th term of an AS. is \( \frac{55}{2} \) and the 2-nd term is \( \frac{7}{2} \). Find the 1-st term.

**Solution:**

1. The systematic way to solve this problem is to say

\[
\begin{align*}
    a_n &= a + (n-1)d \\
    a_{10} &= a + 9d \\
    a_2 &= a + d
\end{align*}
\]

and \( a_{16} = \frac{55}{2}, \ a_2 = \frac{7}{2} \).

So \[
\begin{align*}
    a + 9d &= \frac{55}{2} \\
    a + d &= \frac{7}{2}
\end{align*}
\]*

We build a system of equations.

2. Clear fractions and solve (I choose elim.)

\[
\begin{align*}
    2a + 18d &= 55 \\
    2a + 2d &= 7
\end{align*}
\]

and, "back-sub"

\[
\begin{align*}
    2a + 2d &= 7 \\
    2a + 6 &= 7 \\
    2a &= 1 \\
    a &= \frac{1}{2}
\end{align*}
\]

\[16d = 48 \quad \Rightarrow \quad d = 3\]

This is what we're looking for!

3. The first term is \( \frac{1}{2} \).

I'll do more later!