1. $\boxed{4}$

2. $\boxed{x = 9, y = 6}$

3. $\boxed{\text{(a) } x = 10 \quad \text{(b) } x = 12 \quad \text{(c) } x = \sqrt{21} \quad \text{(d) } x = 2 \quad \text{(e) } x = \frac{8}{3} \quad \text{(f) } x = 3}$

4. In right $\triangle TPA$, we can find $TP = 3\sqrt{3}$. Then we can use the following proportion to find AB:

$$\begin{aligned} (TP)^2 &= (PA)(PA + AB) \\ (3\sqrt{3})^2 &= 3(3 + AB) \\ 27 &= 9 + 3(AB) \\ 18 &= 3(AB) \\ AB &= \boxed{6} \end{aligned}$$

Most of you got this far and stopped.

The distance from a point to a line is the length of the perpendicular to the line from that point. So for (b) we can draw a perpendicular from O to $\overline{AB}$, intersecting at M. $TOMP$ clearly makes a rectangle so $OM = TP = \boxed{3\sqrt{3}}$.

To find (c) we draw $\overline{OA}$ and $\overline{OB}$ we show that $\triangle OMA \cong \triangle OMB$ to get that $AM = AB = \frac{6}{2} = 3$. This gives us $PM = 3 + 3 = 6$ but in rectangle $TOMP$, $PM = OT = \boxed{6}$ which is a radius.