Solutions #2 **Bergen County Math League** **2018–2019**

2–1. $2\pi r = \pi r^2 \Rightarrow \pi r(r-2) = 0 \Rightarrow r = 2$.

2–2. Add the second and third equations to get $(k+1)x = k+1$, which means $k = -1$ or $x = 1$. If $k = -1$, the second and third equations are equivalent, and not parallel to the first equation, so the system certainly has a solution. If $x = 1$, then $y = 1$ as well because of the first equation, and then the second and third equations give $k = 0$.

2–3. The image of P in l is $P'(1,4)$. $\overline{P'R}$ intersects l in the solution of the system

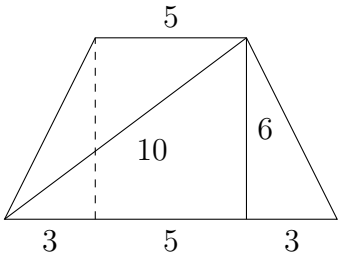
$$\begin{cases} y = x \\ \frac{y}{x-3} = \frac{4}{-2} \end{cases}$$

which is the point $(2,2)$.

2–4. Starting with the expression given,

$$\begin{aligned}(ab-cd)^2 + (ad+bc)^2 &= a^2b^2 + c^2d^2 + a^2d^2 + b^2c^2 \\ &= a^2(b^2+d^2) + c^2(b^2+d^2) \\ &= (a^2+c^2)(b^2+d^2)\end{aligned}$$

2–5.



$$\frac{1}{2}(11+5)6 = 48$$

2–6. Cube all the numbers:

$$\begin{aligned}a^3 &= \left(\sqrt{.16}\right)^3 = (.4)^3 = .064 \\ b^3 &= .0639 \\ c^3 &= \sqrt{.0041} > .064 \quad (\text{since } (.64)^2 = .004096) \\ d^3 &= .000064\end{aligned}$$