Consider the function \( Q = 15\sqrt{8Y - p^2} \).

1. (4 pts) Find \( \frac{\partial Q}{\partial Y} \mid_{Y=17, p=6} \)

\[
\frac{\partial Q}{\partial Y} = 15 \cdot \frac{1}{2} \left( 8Y - p^2 \right)^{-1/2} \cdot 8 = \frac{60}{\sqrt{8Y - p^2}} \quad \text{so} \quad \frac{\partial Q}{\partial Y} \mid_{Y=17, p=6} = \frac{60}{\sqrt{136 - 36}} = 6.
\]

2. (4 pts) Find \( \frac{\partial Q}{\partial p} \mid_{Y=17, p=6} \)

\[
\frac{\partial Q}{\partial p} = 15 \cdot \frac{1}{2} \left( 8Y - p^2 \right)^{-1/2} \cdot (-2p) = -\frac{15p}{\sqrt{8Y - p^2}} \quad \text{so} \quad \frac{\partial Q}{\partial p} \mid_{Y=17, p=6} = -\frac{15 \cdot 6}{\sqrt{136 - 36}} = -9.
\]

3. (2 pts) Suppose that \( Y \) increases from \( Y = 17 \) to \( Y = 17.3 \), and use linear approximation to estimate \( \Delta Q \). What assumption must you make to justify your estimate?

Assuming that the price is held constant (\( \Delta p = 0 \))

\[
\Delta Q \approx \left. \frac{\partial Q}{\partial Y} \right|_{Y=17, p=6} \cdot \Delta Y = 6 \cdot 0.3 = 1.8
\]