$p = 422$

$422 = 4x^2 + 2x + 2$

$-422 \qquad\qquad -422$

$\rightarrow 4x^2 + 2x - 420 = 0$

~~$2x^2 + 2x - 210 = 0$~~

$$x = \frac{-2 \mp \sqrt{4 - 4(4)(-420)}}{2(4)}$$

$$= \frac{-2 \mp 82}{8}$$

$$= \frac{-2 + 82}{8} = 10 \quad \text{or} \quad \frac{-8\,82}{8} = -11.25$$

$\therefore$ Eq. point $(10, 422)$.

$$PS = 10(422) - \int_0^{10} (4x^2 + 2x + 2)\, dx$$

$$= 4220 - \left[\frac{4x^3}{3} + \frac{2x^2}{2} + 2x\right]_0^{10}$$

$$= 4220 - \left[\frac{4(10)^3}{3} + 10^2 + 20\right]$$

$$= 4220 - 1453.3$$

$$= 2766.6$$