Q1 (20 July 2021 Shift 1)

Let the tangent to the parabola $S: y^2=2x$ at the point $\mathrm{P}(2,2)$ meet the x -axis at Q and normal at it meet the parabola S at the point R. Then the area (in sq. units) of the triangle PQR is equal to:

(1) $\frac{25}{2}$

(2) $\frac{35}{2}$

(3) $\frac{15}{2}$

(4) 25

Q2 (20 July 2021 Shift 1)

Let $y=mx+c, m>0$ be the focal chord of $y^2=-64x$, which is tangent to $(x+10)^2+y^2=4$ Then, the value of $4\sqrt{2}(\mathrm{~m}+\mathrm{c})$ is equal to ___

Q3 (20 July 2021 Shift 2)

Let P be a variable point on the parabola $\mathrm{y}=4\mathrm{x}^2+1$. Then, the locus of the mid-point of the point P and the foot of the perpendicular drawn from the point P to the line $\mathrm{y}=\mathrm{x}$ is :

(1) $(3x-y)^2+(x-3y)+2=0$

(2) $2(3x-y)^2+(x-3y)+2=0$

(3) $(3x-y)^2+2(x-3y)+2=0$

(4) $2(x-3y)^2+(3x-y)+2=0$

Q4 (20 July 2021 Shift 2)

If the point on the curve $\mathrm{y}^2=6\mathrm{x}$, nearest to the point $\left(3, \frac{3}{2}\right)$ is (α, β), then $2(\alpha+\beta)$ is equal to

Q5 (25 July 2021 Shift 1)

Let a parabola P be such that its vertex and focus

lie on the positive x -axis at a distance 2 and 4 units from the origin, respectively. If tangents are drawn from $O(0,0)$ to the parabola P which meet P at S and R, then the area (in sq. units) of ΔSOR is equal to

(1) $16\sqrt{2}$

(2) 16

(3) 32

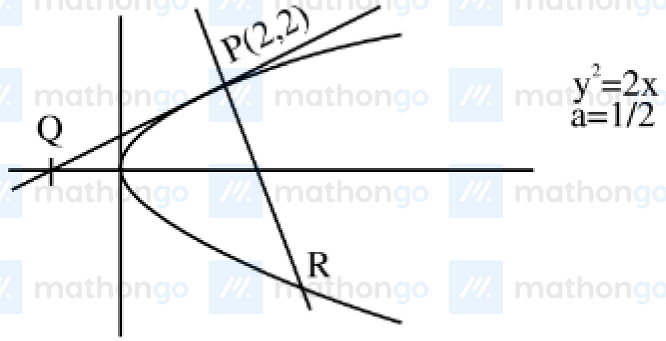
(4) $8\sqrt{2}$

Answer Key

Q1 (1) **Q2** (34) **Q3** (2) **Q4** (9)

Q5 (2)

Q1



Tangent at $P: y(2)=2(1/2)(x+2)$

$\Rightarrow 2y=x+2$

$\therefore \quad Q=(-2,0)$

Normal at $P: y-2=-\frac{(2)}{2.1/2}(x-2)$

$\Rightarrow y-2=-2(x-2)$

$\Rightarrow y=6-2x$

$\therefore$ Solving with $y^2=2x \Rightarrow R\left(\frac{9}{2}-3\right)$

$$\therefore \operatorname{Ar}(\Delta PQR)=\frac{1}{2}\left|\begin{array}{ccc} 2 & 2 & 1 \\ -2 & 1 & 1 \\ \frac{9}{2} & 3- & 1 \end{array}\right|$$

$=\frac{25}{2}$ sq.units

Q2

$y^2=-64x$

focus : $(-16,0)$

$\mathrm{y}=\mathrm{mx}+\mathrm{c}$ is focal chord

$\Rightarrow \mathrm{c}=16\ \mathrm{m}$

$y=mx+c$ is tangent to $(x+10)^2+y^2=4$

$\Rightarrow \mathrm{y}=\mathrm{m}(\mathrm{x}+10) \pm 2\sqrt{1+\mathrm{m}^2}$

$\Rightarrow \mathrm{c}=10\ \mathrm{m} \pm 2\sqrt{1+\mathrm{m}^2}$

$\Rightarrow 16\ \mathrm{m} = 10\ \mathrm{m} \pm 2\sqrt{1+\mathrm{m}^2}$

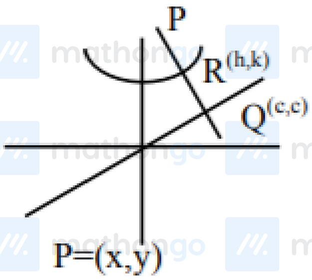
$\Rightarrow 6\ \mathrm{m} = 2\sqrt{1+\mathrm{m}^2} \quad (\mathrm{m} > 0)$

$\Rightarrow 9\ \mathrm{m}^2 = 1 + \mathrm{m}^2$

$\Rightarrow \mathrm{m} = \frac{1}{2\sqrt{2}} \& \mathrm{c} = \frac{8}{\sqrt{2}}$

$4\sqrt{2}(\mathrm{m}+\mathrm{c}) = 4\sqrt{2}\left(\frac{17}{2\sqrt{2}}\right) = 34$

Q3



$\frac{\mathrm{K}-\mathrm{C}}{\mathrm{h}-\mathrm{C}} = -1$

$\mathrm{C} = \frac{\mathrm{h}+\mathrm{K}}{2}$

$\mathrm{R} = \left(\frac{\mathrm{x}+\mathrm{C}}{2}, \frac{\mathrm{y}+\mathrm{C}}{2}\right)$

$\mathrm{R} = \left(\frac{\mathrm{x}}{2} + \frac{\mathrm{h}}{4} + \frac{\mathrm{K}}{4}, \frac{\mathrm{y}}{2} + \frac{\mathrm{h}}{4} + \frac{\mathrm{k}}{4}\right)$

$\mathrm{h} = \frac{\mathrm{x}}{2} + \frac{\mathrm{h}}{4} + \frac{\mathrm{K}}{4}$

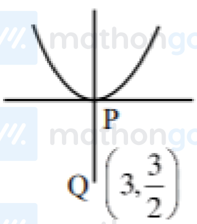
$\mathrm{K} = \frac{\mathrm{y}}{2} + \frac{\mathrm{h}}{4} + \frac{\mathrm{K}}{4}$

$\Rightarrow \mathrm{x} = \frac{3\ \mathrm{h}}{2} - \frac{\mathrm{K}}{2}, \mathrm{y} = \frac{3\ \mathrm{K}}{2} - \frac{\mathrm{h}}{2}$

$\mathrm{Y} = 4\mathrm{x}^2 + 1$

$\left(\frac{3\mathrm{k}-\mathrm{h}}{2}\right) = 4\left(\frac{3\ \mathrm{h}-\mathrm{k}}{2}\right)^2 + 1$

Q4



$P \equiv \left(\frac{3}{2}t^2, 3t\right)$

Normal at point P $\mathrm{tx} + \mathrm{y} = 3\mathrm{t} + \frac{3}{2}\mathrm{t}^3$

Passes through $\left(3, \frac{3}{2}\right)$

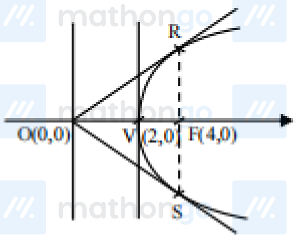
$\Rightarrow 3\mathrm{t} + \frac{3}{2} = 3\mathrm{t} + \frac{3}{2}\mathrm{t}^3$

$\mathrm{P} \equiv \left(\frac{3}{2}, 3\right) = (\alpha, \beta)$

$\Rightarrow \mathrm{t}^3 = 1 \Rightarrow \mathrm{t} = 1$

$2(\alpha + \beta) = 2\left(\frac{3}{2} + 3\right) = 9$

Q5



Clearly RS is latus-rectum

$\therefore VF = 2 = a$

$\therefore \mathrm{RS} = 4\mathrm{a} = 8$

Now $\mathrm{OF} = 2\mathrm{a} = 4$

$\Rightarrow$ Area of triangle ORS $= 16$