

Solutions

Accept equivalent correct methods and supported interpretations. The marks check reasoning; they are not an official grade.

2.1 C – The denominator is the semiaxis squared. A doubles the semiaxis into an axis length; B reads the vertical denominator's root; D uses the squared semiaxis.

Correct response linked to the given case.

2.2 D – $\pi \cdot 2^2 \cdot 9/3 = 12\pi$. A gives cylinder volume without the factor one third; B uses an incorrect radius contribution; C understates the cone volume by a factor of two.

Correct response linked to the given case.

2.3 5 – Radius squared is 25.

Correct response linked to the given case.

2.4 True – They are perpendicular at that point.

Correct response linked to the given case.

3.1 Centre is $(-2, 1)$, semiaxes 5 and 3, endpoints $(-7, 1)$, $(3, 1)$, $(-2, -2)$, $(-2, 4)$. In the parabola, $4p = -12$, so $p = -3$; vertex $(0, 0)$, focus $(-3, 0)$.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence
. Accurate conditions, checks or qualification.

3.2 Use tangent–secant relation $t^2 = ew$. Rearrange $w = t^2/e = (6\text{ cm})^2/(4\text{ cm}) = 9\text{ cm}$. Inside length is $w - e = 9\text{ cm} - 4\text{ cm} = 5\text{ cm}$. The product uses whole length, not just inside.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.

3.3 $V = \pi r^2 h = \pi(3\text{ cm})^2(8\text{ cm}) = 72\pi\text{ cm}^3$. $A = 2\pi r^2 + 2\pi r h = 2\pi(3\text{ cm})^2 + 2\pi(3\text{ cm})(8\text{ cm}) = 66\pi\text{ cm}^2$. Doubling all lengths multiplies volume by 8 and area by 4.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.

3.4 The difference of squared terms defines a hyperbola centred at the origin. The sum with equal coefficients defines a circle of radius 4. Its circumference is $C = 2\pi r = 8\pi$ and area $A = \pi r^2 = 16\pi$ in coordinate length and square-length units respectively. Secant products match: $e_1 w_1 = e_2 w_2$. Thus $w_2 = (3\text{ cm})(12\text{ cm})/(4\text{ cm}) = 9\text{ cm}$; inside length is $9 - 4 = 5\text{ cm}$. Outside times inside would apply the wrong relation.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.