

Solutions

2.1 C. Factor the argument as $3(x - \pi/3)$. The phase π is divided by angular frequency 3. π is the phase before division; three π multiplies rather than divides; two π over three is the period, and one-third omits the phase π .

2.2 C. The parameter interval keeps both coordinates nonnegative. Elimination gives the astroid relation, but does not remove this quadrant restriction. The full curves exceed the parameter interval; the circle and line have different equations. The restricted first-quadrant arc alone matches both coordinate signs and the astroid relation.

2.3 Amplitude is three and period $2\pi/2 = \pi$. Write $y = 3\cos(2x - \pi)$, with phase π and rightward shift $\pi/2$. Phase and shift are not the same. One parametrisation is $x = 3\cos t, y = 2\sin t, 0 \leq t \leq 2\pi$, which begins at $(3, 0)$ and initially moves upward. Eliminating t checks the ellipse equation.

3.1 Elimination gives $y^2 = x^3$, with $0 \leq x \leq 1$ and both signs of y . For t nonzero, $dy/dx = 3t/2 \rightarrow 0$. The secant slope from the origin is $y/x = t \rightarrow 0$ too, so the cusp has horizontal tangent. Both parameter derivatives vanish at zero, making the raw quotient $0/0$ inconclusive, not proving absence of a tangent. The unrestricted implicit equation also has points with $x > 1$; the interval restriction must be carried separately.

Local four-mark guidance for each written task: choose and justify the method; carry through the reasoning; give every requested result; check the relevant restriction, hypothesis or boundary case. These are classroom marks, not GRE scoring.