Sine/cosine parameterisations and circular motion

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Find the Cartesian locus of $(3\cos t, 2\sin t)$. [2 marks]

Divide by the amplitudes, square and add.

Use the Pythagorean trig identity.

Answer: $x^2/9 + y^2/4 = 1$.

2. Find speed and acceleration magnitude for $(5\cos 2t, 5\sin 2t)$. [2 marks]

Use radius times angular speed for speed.

Use radius times angular speed squared for acceleration.

Answer: 10 and 20.

3. At 0, describe direction for $(2\cos t, -2\sin t)$. [2 marks]

The derivative at zero is (0, -2).

That is downward at the rightmost point.

Answer: Down from (2, 0), clockwise.

4. Find centre and radius of $(1+4\cos t,\ -2+4\sin t)$. [2 marks]

The constants shift the centre.

The equal amplitudes give the radius.

Answer: Centre (1, -2), radius 4.

5. Find speed for $(2\cos t, 2\sin t, t)$. [2 marks]

Velocity is $(-2\sin t, 2\cos t, 1)$.

Squared speed is 4+1.

Answer: $\sqrt{5}$

6. Compare speeds at 0 and $\pi/2$ for $(4\cos t, 2\sin t)$. [2 marks]

Velocity is $(-4\sin t, 2\cos t)$.

The specified times give (0, 2) and (-4, 0).

Answer: 2 and 4.