

23. C.8 · Trigonometric phase and parametric curves

Starter Quiz ·

GRE Subject Test · GRE Mathematics

Name: _____ Score: _____

1. What is the period of $y = 5 \sin(4x + 1)$? Give a decimal to three places.

2. $y = \cos(2x - \pi/2)$ is $y = \cos 2x$ shifted right by

☐ π

☐ $\pi/2$

☐ 2π

☐ $\pi/4$

3. $x = t^2 + 1$, $y = t^3 - 3t$. Find dy/dx at $t = 2$.

4. For $x = t^2 + 1$, $y = t^3 - 3t$, horizontal tangents occur at

☐ $t = 0$

☐ no value of t

☐ $t = \pm 1$

☐ $t = \pm\sqrt{3}$

5. The curve $x = \cos t$, $y = \sin t$, $0 \leq t \leq \pi$, is the whole unit circle.

☐ True ☐ False

6. What is the amplitude of $y = -3 \cos 2x + 5$?

7. Adding 2π to the phase offset of a cosine wave changes its graph.

☐ True ☐ False

8. For $x = t^2$, $y = t$, with $-1 \leq t \leq 2$, which describes the exact point set?

☐ $x = y^2$ with no further restriction

☐ $y = x^2$ and $-1 \leq x \leq 2$

☐ $x = y^2$ and $-1 \leq y \leq 2$

☐ $x = y^2$ and $y \geq 0$

9. How many complete circuits does $x = 2 \cos 2t$, $y = \sin 2t$ make for $0 \leq t \leq 2\pi$?

10. If $x'(0) = 0$ and $y'(0) \neq 0$, the parametrized motion is stationary at $t = 0$.

☐ True ☐ False

23. C.8 · Trigonometric phase and parametric curves

Answers ·

GRE Subject Test · GRE Mathematics

1. **1.571**

The nonconstant wave has period $2\pi/|4|=\pi/2\approx 1.571$. Amplitude 5 and the argument offset do not change its period. In the form $4x-\varphi$, the phase offset is $\varphi=-1$.

2. $\pi/4$

Write $\cos(2x - \pi/2) = \cos 2(x - \pi/4)$. The shift is $\varphi/\omega = (\pi/2)/2 = \pi/4$ to the right, not $\pi/2$.

3. **2.25**

$dy/dx = (dy/dt)/(dx/dt) = (3t^2 - 3)/(2t)$. At $t = 2$: $(12 - 3)/4 = 9/4 = 2.25$.

4. $t = \pm 1$

Solve $y'=3t^2-3=0$, giving $t=\pm 1$. At both values $x'=2t$ is nonzero. The corresponding points are $(2,-2)$ and $(2,2)$; $t=0$ instead gives a regular vertical tangent.

5. **False**

False. $x^2 + y^2 = 1$ holds, but for $0 \leq t \leq \pi$ we have $y = \sin t \geq 0$, so the curve is only the upper semicircle. The parameter range matters.

6. **3**

Amplitude is the magnitude of the oscillating coefficient. The negative sign changes phase, and 5 sets the midline.

7. **False**

Cosine is 2π -periodic in its argument. The resulting horizontal shift changes by one full period, which gives the same graph.

8. $x = y^2$ **and** $-1 \leq y \leq 2$

Eliminating gives $x=y^2$, but the original parameter equals y , so retain $-1 \leq y \leq 2$. Conversely, every point with these conditions is recovered by $t=y$.

9. **2**

The angle $2t$ runs from 0 to 4π , so the ellipse is traversed twice; the final endpoint returns to the start.

10. **False**

The velocity vector $(0, y'(0))$ is nonzero. This is a regular vertical tangent, not zero velocity.