Quiz for ~~titten~~ lecture 5.

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Section: 8:40 - 10:00 A.M.

1. Find the curvature for $r(t) = \sin t\, i + \cos t\, j + t k$.

$$r'(t) = \langle \cos t, -\sin t, 1 \rangle.$$

$$r''(t) = \langle -\sin t, -\cos t, 0 \rangle.$$

$$k = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3} = \frac{|\langle \cos t, -\sin t, -1 \rangle|}{\left(\sqrt{\cos^2 t + \sin^2 t + 1}\right)^3}$$

$$= \frac{\sqrt{\cos^2 t + \sin^2 t + 1}}{2^{\frac{3}{2}}}$$

$$= 2^{\frac{1}{2} - \frac{3}{2}} = \frac{1}{2}.$$

2. Find the velocity, acceleration, the speed of particle.

$$r(t) = t\, i + t^2 j + 5 k$$

$$v(t) = r'(t) = i + 2t j$$

$$a(t) = v'(t) = 2 j.$$

$$|v(t)| = \sqrt{1 + (2t)^2} = \sqrt{4t^2 + 1}$$