Clicker Questions After HW3

1. Which of the following represents $\frac{\vec{\kappa}}{|\vec{\kappa}|}$?
   a) B
   b) N
   c) B'
   d) N'
   e) T'

2. Which of the following represents $-\kappa T - \tau B$?
   a) B
   b) N
   c) B'
   d) N'
   e) T'

3. Which of the following measures the deviation from a constant speed path?
   a) position
   b) velocity
   c) acceleration
   d) curvature
   e) torsion

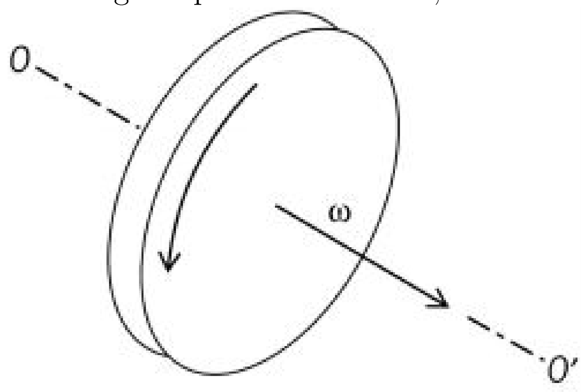
4. Which of the following measures the twisting out of a plane?
   a) position
   b) velocity
   c) acceleration
   d) curvature
   e) torsion

5. Combining the T' Frenet equation with the expression for T' in the Darboux vector (angular velocity), and writing ω in terms of the basis given by T, N and B, we can compute:

   $$T' = \kappa N = \omega \times T = (c_1 T + c_2 N + c_3 B) \times T$$

   and from there obtain
   a) $T' = 0$
   b) $c_1 = 0$
   c) $T' = c_2(-B) + c_3 N$
   d) $c_2 = 0$
   e) more than one answer holds

6. In the following image, if a coaster car is traveling for a bit on a coaster shaped like the following, following the path of the arrow,



a) τ is 0

b) B is the only axis of the spin in this case for the Darboux vector $\omega = \pm\tau T + \kappa B$, which points perpendicular to the coaster

c) the people in the coaster would feel the curvature of the curve as a tilt

d) the people in the coaster would feel the curvature pulling them sideways

e) more than one answer holds from a), b) and c) but not all of them

7. The parametrization of the inner annulus circle from the homework is

a) $(\cos t, \sin t, \frac{10t}{2\pi})$

b) $(1.2\cos t, 1.2\sin t, \frac{10t}{2\pi})$

c) $(\frac{\pi^2+25}{\pi^2}\cos t, \frac{\pi^2+25}{\pi^2}\sin t, 0)$

d) $((.2 + \frac{\pi^2+25}{\pi^2})\cos t, (.2 + \frac{\pi^2+25}{\pi^2})\sin t, 0)$

e) $(\cos t, \sin t, 0)$

8. The parametrization of the outer strake from the homework is

a) $(\cos t, \sin t, \frac{10t}{2\pi})$

b) $(1.2\cos t, 1.2\sin t, \frac{10t}{2\pi})$

c) $(\frac{\pi^2+25}{\pi^2}\cos t, \frac{\pi^2+25}{\pi^2}\sin t, 0)$

d) $((.2 + \frac{\pi^2+25}{\pi^2})\cos t, (.2 + \frac{\pi^2+25}{\pi^2})\sin t, 0)$

e) $(\cos t, \sin t, 0)$

9. The arc length of the inner and outer strake can be computed in Maple by going from 0 to 2π. The inner length of the annulus is the same as the inner length of the strake ArcLength($< \cos t, \sin t, \frac{10t}{2\pi} >, t = 0..2\pi$) $= 2\sqrt{\pi^2 + 25}$ since we cut it to match the lengths. To compute the outer length of the annulus, we can:

   a) Use the arclength command on the parametrization of the outer annulus $((.2+\frac{\pi^2+25}{\pi^2})\cos t, (.2+\frac{\pi^2+25}{\pi^2})\sin t, 0)$ in Maple from 0 to 2π

   b) Set up a proportion: length of the inner annulus/inner radius = length of the outer annulus/outer radius $= \frac{2\sqrt{\pi^2+25}}{\frac{\pi^2+25}{\pi^2}} = \frac{\text{length}}{.2+\frac{\pi^2+25}{\pi^2}}$ and solve from there to obtain ≈ 12.479

   c) Set it equal to the arc length of the outer helix: ArcLength($< 1.2\cos t, 1.2\sin t, \frac{10t}{2\pi} >, t = 0..2\pi$) ≈ 12.524

   d) Solve for the time that the arc length of the inner annulus matches the arc length of the inner helix from 0 to 2π and use that time in the outer annulus computation

   e) None of the above