Math 275 : In-class exercise #6

1. A particle travels along the curve $r(t)$ in three-space with speed $v(t)$. Let $T(t)$ be a unit tangent vector to the curve and let $N(t)$ be a unit normal to the curve. The curve has curvature $\kappa(t)$. From the two lists below, match directions from the first list with vectors from the second list. If a vector is a linear combination of directions, describe as best you can the linear combination. If directions listed are the same, say so.

(a) The $T(t)$ direction,
(b) The $T'(t)$ direction,
(c) The $N(t)$ direction,
(d) The $N'(t)$ direction,
(e) The $r'(t)$ direction,
(f) The $r''(t)$ direction,

(a) The velocity vector $v(t)$.
(b) The acceleration vector $a(t)$.
(c) The unit tangent vector $T(t)$.
(d) The unit normal vector $N(t)$.
(e) The vector $T'(t)$.
(f) The vector $N'(t)$.

2. A particle is moving with constant speed 2 along the helix parameterized as $r(t) = (\cos(t) \sin(t), t)$. What is the acceleration of the particle? What are the tangent and normal components of the acceleration?

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