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Feedback 3-4

General comments:

- Please, think about the nature of the objects before doing any operations ith them, in particular, it is impossible to divide by vectors!!!
- This is a Differential Geometry course, so, please try to think about geometric interpretations of your answers.
- It is not always practicle to compute everything in coordinates: in many cases writing in invariant terms and using general formulae brings you to the answer quicker.

Question 3.2:

- Most works contained correct solution of this question, however, by unclear reason this is the question where many students wanted to divide by a vector (which is impossible!). If you want to find a scalar λ from the equation $\boldsymbol{a} = \lambda \boldsymbol{b}$ (where $\boldsymbol{a}$ and $\boldsymbol{b}$ are vectors), you can write $\lambda = \frac{||\boldsymbol{a}||}{||\boldsymbol{b}||}$.
- The solution of part (a) often involved computation of A^2 where A is the matrix of a rotation by $\pi/2$. There is no need to compute A^2 as a product of two matrices: the composition of two rotations by $\pi/2$ about the same point is the rotation by π, i.e. the transformation $-I$ taking every vector to negative itself.
- This question has a very short solution, where one uses general formulae like $\boldsymbol{t}'(u) = \kappa(u) \cdot \boldsymbol{n}(u)$. The same solution turns out to be much longer when one writes everything in coordinates starting from $\boldsymbol{\alpha}(u) = (x(u), y(u))$ and expressing everything through $x(u)$ and $y(u)$.

Question 4.2:

- When one needs to compute the curvature and the torsion, the first step is to choose the formula you are going to use. Making this choice, please, think whether your parameter is arc length or not and make sure your formula is valid for that case. In particular, Serret-Frenet formulae are only applicable for the case of arc length parametrisation.
- A number of solutions lucked "-" in the expression $\tau = -\frac{(\boldsymbol{\alpha}' \times \boldsymbol{\alpha}'') \cdot \boldsymbol{\alpha}'''}{||\boldsymbol{\alpha}' \times \boldsymbol{\alpha}''||^2}$.
- It is a good practice to simplify your answer (at least, when this does not take too much of time), but the computations still should be correct! Most mistakes in this question appeared at this last simplification step: by some reason it turned out to be very difficult to compute $36/4$ correctly.

Question 4.3:

- In part (a) many students wrote the equations for the curve, but have not noticed this is actually an equation of a line.
- In part (a), it does not help to write everything in coordinates (compare with the last comment to Question 3.2).
- In part (b), most solutions derived that $b' = 0$ and hence b is a constant vector. From this, it was derived that the osculating plane is constant. However, constant binormal vector only implies that all osculating planes are parallel to each other, and one needs to spend a little bit more work to show that they actually do coincide.