

1. Find all tangent lines to the ellipse $x^2 + 4y^2 = 5$ which pass through the point $(-5, 0)$.

Your solution should describe how you know that you have found all of the solutions.

2. A plane is flying east at 180 kilometers/hour. The plane's altitude is 4 kilometers.
 - (a) Find the angle of elevation one minute after the plane flies directly over an observer. (You will not be able to give an exact answer to this question. Please round your answer to three decimal places.)
 - (b) Make a sketch showing the observer, the plane and the angle of elevation.
 - (c) Find the derivative of the angle of elevation one minute after the plane flies directly over the observer.
 - (d) Find the rate of change of the angle of elevation one minute after the plane flies directly over the observer. Is the angle of elevation increasing or decreasing?
 - (e) Find the distance between the observer and the plane one minute after the plane flies over the observer.
 - (f) Find the rate at the which the distance between the plane and the observer is changing one minute after the plane flies over the observer. Is the distance increasing or decreasing?
3. (Bonus) The son of the professor's father is talking to the father of the professor's son. Is the professor necessarily speaking? Explain.

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