

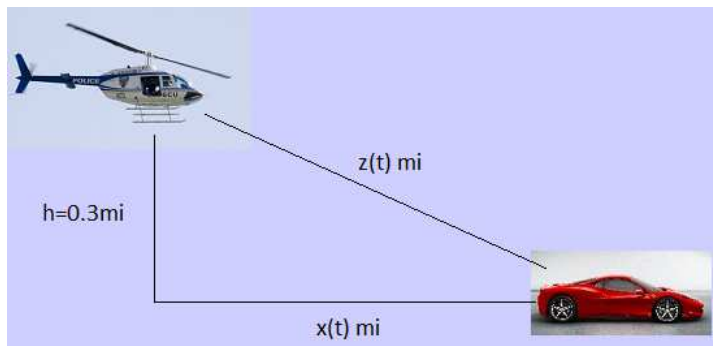
YOUR NAME: \_\_\_\_\_

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Find an equation for the tangent line to the graph of  $x^2 + y^2 = 2x^2y - 23$  at  $(x, y) = (3, 2)$ .

2. A traffic control helicopter is **stationary** 0.3 miles directly above Interstate 75, as shown in the figure below. Its radar detects a Ferrari<sup>®</sup> 458-Italia whose line-of-sight distance from the helicopter is 0.5 miles and increasing at the rate of 64 mph. If the speed limit at that stretch of Interstate 75 is 75 mph, should the helicopter radio a traffic patrol car to issue a ticket?



3. It is year 2013 and Isaac wants to set up a fund for his son Ben's college education. At present, the total cost of a four-year private college education is estimated to be \$70,000, but is projected to increase by an average annual rate of 4% in the foreseeable future. How large of a trust fund, paying 12% compounded monthly should Isaac establish now, that Ben is 3 years old, to ensure that Ben will have sufficient funds when he is ready to attend college at age 18?
4. Find an equation for the tangent line to the graph of  $f(x) = \ln(e^x - 3x)$  at  $x = 0$ .

5. **Create the sign table** for the first and second derivatives of the function  $f(x) = xe^{-x}$  clearly showing intervals of monotonicity, relative max/min points, intervals of concavity and inflection points. (You do **not** have to sketch the graph of  $y = f(x)$ .)