1. You are climbing a mountain by the steepest route with angle of ascent 20° when you come upon a branching trail 30° from yours. What is the angle of ascent of the other trail?

2. Find the second order Taylor approximation to \( \cos(x + 2y) \) at the origin.

3. A child is sucking on a cylindrical popsicle with diameter \( d \) and length \( h \). When \( d = 3 \) cm and \( h = 10 \) cm, the diameter is shrinking at 0.2 cm/s and the length is shrinking at 0.1 cm/s. How fast is the popsicle disappearing? In other words, what is the rate of change of volume?

4. ACME produces roadrunner traps at two locations in quantities \( q_1 \) and \( q_2 \). The total cost of production is \( 2q_1^2 + q_1q_2 + q_2^2 + 500 \). If ACME wants to produce 200 traps, how should the production be split between the two locations to minimize cost?

5. A solid is bounded by the coordinate planes and the plane \( 2x + 3y + z = 6 \). If the density of the solid is \( 10 + x + y \), find its mass. You may omit the integration once you've set up the iterated integral.