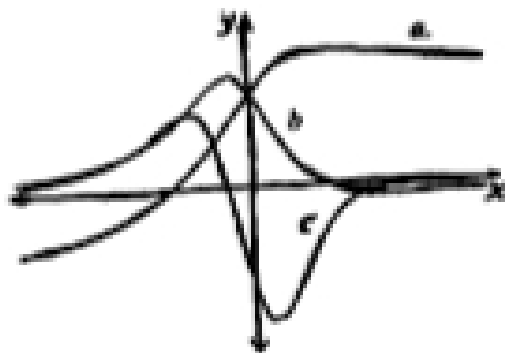# Practice Problems Midterm II
Calculus I - Section 7 and 8
Fall 2011

Exercise 1. *The figures shows the graphs of f, f' and f''. Identify each curve and explain your choice.*

Exercise 2. *Show that the curve $x^2 + xy + y^2 = 3$ has horizontal tangent lines at the point $(1, -2)$ and $(-1, 2)$, and that it has vertical tangent lines at the points $(2, -1)$ and $(-2, 1)$.*

Exercise 3. *A runner sprints around a circular track of radius 100 m at a constant speed of $7\,m/s$. The runner's friend is standing at a distance 200m from the center of the track. How fast is the distance between the friends changing when the distance between them is $200\,m$?*

Exercise 4. *Prove that the equation $1 + 4x + 3\cos x = 0$ has exactly one real root.*

Exercise 5. *Sketch the graph of the curve $f(x) = \frac{\sin x}{1+\cos x}$. Write down the relevant information you used to sketch the graph.*

Exercise 6. *Find an equation of the line through the point $(3, 5)$ that cuts off the least area from the first quadrant.*

Exercise 7. *Of the infinitely many lines that are tangent to the curve $y = -\sin x$, and pass through the origin, there is one that has the largest slope. Find the slope of that line correct to six decimal places.*