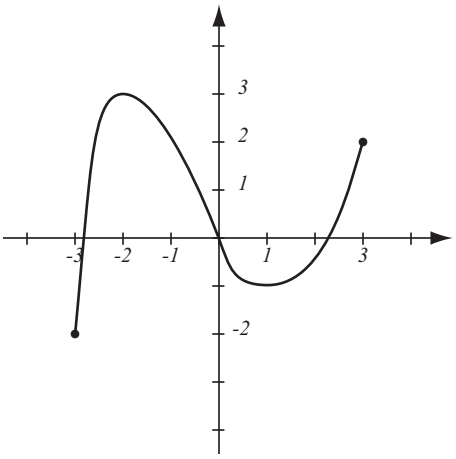
Spring '05/MAT 250/Exam 3 **Name:** *Show all your work.*

1. (6pts) The graph of the function f is given.
a) State where f has an absolute minimum and maximum value, and what the value is.
b) State where f has a local minimum and maximum value, and what the value is.



2. (9pts) Use L'Hospital's rule to find the limits:

a) $\lim_{x \to 0} \dfrac{1 - \cos x}{x^2} =$

b) $\lim_{x \to 0} (1 - 2x)^{\frac{1}{x}} =$

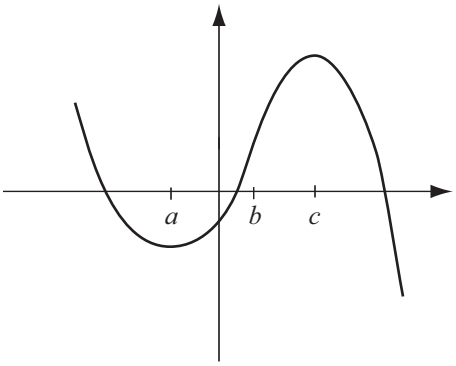
3. (10pts) Let $f(x) = \ln(x^2 + 4)$.
a) Find the intervals of increase/decrease and where f has a local maximum and minimum.
b) Find the intervals where f is concave up or down.
c) Use your calculator and the results of a) and b) to accurately sketch the graph of f.

4. (5pts) Suppose that for a continuous and differentiable function f we have $-2 \leq f'(x) \leq 3$ for all x in $[1, 4]$ and $f(1) = 7$. Use the Mean Value Theorem to show that $1 \leq f(1) \leq 16$.

5. (6pts) Find the absolute minimum and maximum values for the function $f(x) = x - 2\sin x$ on the interval $\left[0, \frac{\pi}{2}\right]$.

6. (7pts) The function $f(x) = \sqrt[4]{x}$ is given.
a) Find the linearization of this function around the point $a = 16$.
b) Determine the values x for which the linear approximation is accurate to within 0.05.

7. (7pts) Use the graph of f to sketch the graphs of f' and f''.



Bonus. (5pts) Use Rolle's theorem to show that the equation $2x + \cos x = 0$ has at most one solution.