

MODULES 110PMA003 & 110PMA107

Department of Pure Mathematics

Week 10, 2001

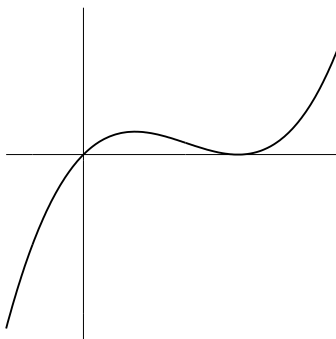
The pdf-file you may download from <http://www.math.berkeley.edu/~halbeis/4students/zero.html>

Please hand in your solutions (stapled together with your full name on the first page) at the lecture on Thursday, 6 December 2001.

42. The functions \sinh and \cosh (called *hyperbolic sine* and *hyperbolic cosine* respectively) are defined as follows:

$$\sinh(x) = \frac{e^x - e^{-x}}{2} \quad \text{and} \quad \cosh(x) = \frac{e^x + e^{-x}}{2}.$$

- (a) Show that for all real numbers x we have $\cosh(x)^2 - \sinh(x)^2 = 1$.
 (b) Find the derivatives of these two functions. Do you see a relationship?
43. Find the derivatives of each of the following functions:
 (a) $f(x) = x^{-3} + x^{-1}$ (b) $f(x) = \ln(2x^2 - x)$ (c) $f(x) = \frac{\ln(x)}{x}$
 (d) $f(x) = x^2 \sin(x)$ (e) $f(x) = e^{\cos(x)}$ (f) $f(x) = \arctan(x)^2$
44. The following is the graph of the function $f(x) = x^3 - 2x^2 + x$ between $x = -0.5$ and $x = 1.65$.



- (a) Determine for which x the function $f'(x)$ is equal to 0.
 (b) Find the point(s) of inflection of $f(x)$.
 (c) Sketch the graph of the function $f'(x)$ between $x = 0$ and $x = 1$.
45. Given the function $f(x) = -\frac{1}{6}(4x^3 - 15x^2 + 12x)$.
 (a) Determine for which x the function $f(x)$ has a local maximum or minimum.
 (b) Find the point(s) of inflection of $f(x)$.
 (c) Sketch the graph of the function $f(x)$ between $x = 0$ and $x = 3$.
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Office hours (Room 1007): Monday 1 pm–2 pm, Wednesday 2 pm–3 pm