Math102 Section 106

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Worksheet for Oct 2, 2017

(1) Sketch the function

$$f(x) = x^4 - 2x^2.$$

Then identify all special points (local min, max, inflection points)

(2) Find the absolute maximum of the following function on the interval $1 \leq x \leq 3$

$$f(x) = x^2 + \frac{4}{x}.$$

(3) Let $f(x) = x^3 + 3x^2 + ax + 1$. For what range of values of a are there no critical points?

(4) A cheetah can run at top speed v_c but it has to slow down (decelerate) to keep from getting too hot. (Assume a constant deceleration $a = -a_c$). A gazelle runs at a slower speed v_g but it can maintain that constant speed for a long time. If the gazelle is initially a distance d from the cheetah, and running away, when would it be caught? Is there a (far enough) distance d such that it never gets caught?

(5) Consider the function

$$y = f(x) = \frac{x^3}{1 - x^2}.$$

(a) Sketch the function by finding its behaviour for large and small x, its zeros, and any other major features before you use any calculus.

(b) Determine the locations of any critical points. Determine what kind of critical points these are and justify your answer.

(c) Find inflection points.