

Tutorials for end of Week 4 / beginning of Week 5

MATH1111: Introduction to Calculus

Semester 1, 2011

Web Page: <http://www.maths.usyd.edu.au/u/UG/JM/MATH1111/>

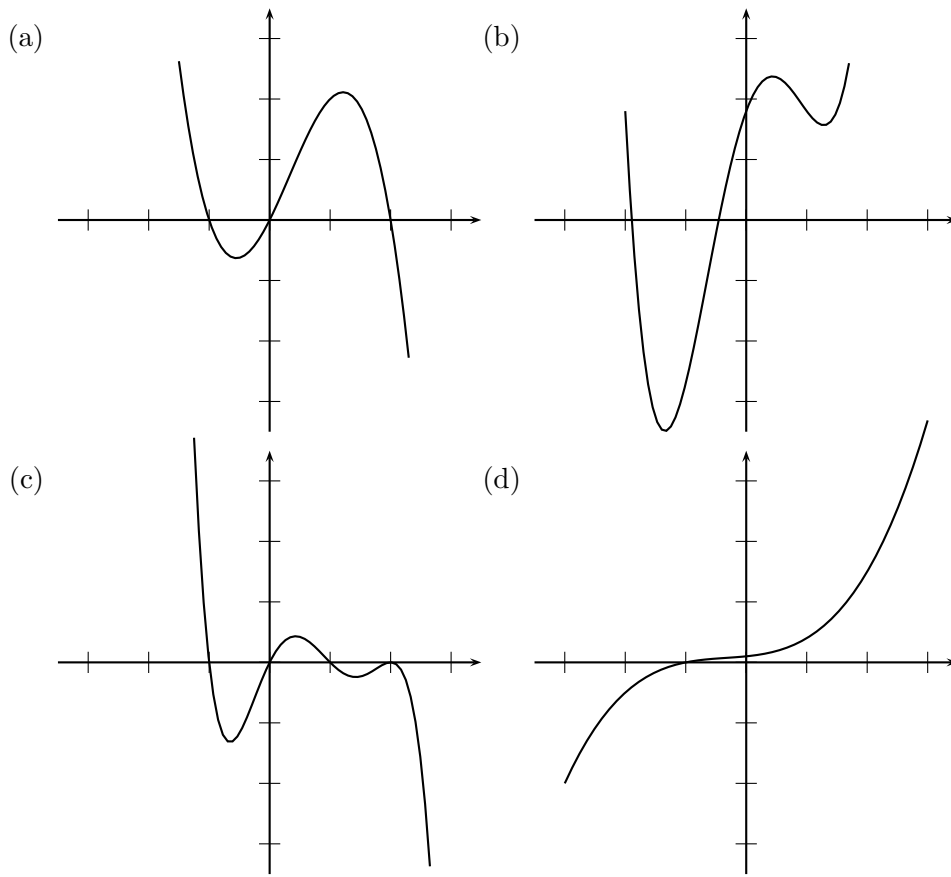
Lecturer: Clio Cresswell

1. A particle's position at time t is given by the parametric equations below. Identify each path by finding its Cartesian equation:
 - (a) $x = t + 2, y = 2t$.
 - (b) $x = t + 1, y = t^2$.
 - (c) $x = 3 \cos t, y = 3 \sin t$.

2. Write a parametric equation that describes the following paths:
 - (a) A circle of radius 2,
 - (b) A line through the origin of gradient 3,
 - (c) A concave down parabola that is symmetric about the y -axis and has y -intercept 1.

3. For each of the functions below, determine which function dominates as $x \rightarrow \infty$:
 - (a) $f(x) = 0.1 \times 2^x$ and $g(x) = 100x^{20}$,
 - (b) $f(x) = \ln(2^x)$ and $g(x) = \ln(x^2)$.
 - (c) $f(x) = \ln(x)$ and $g(x) = \sqrt{x}$.

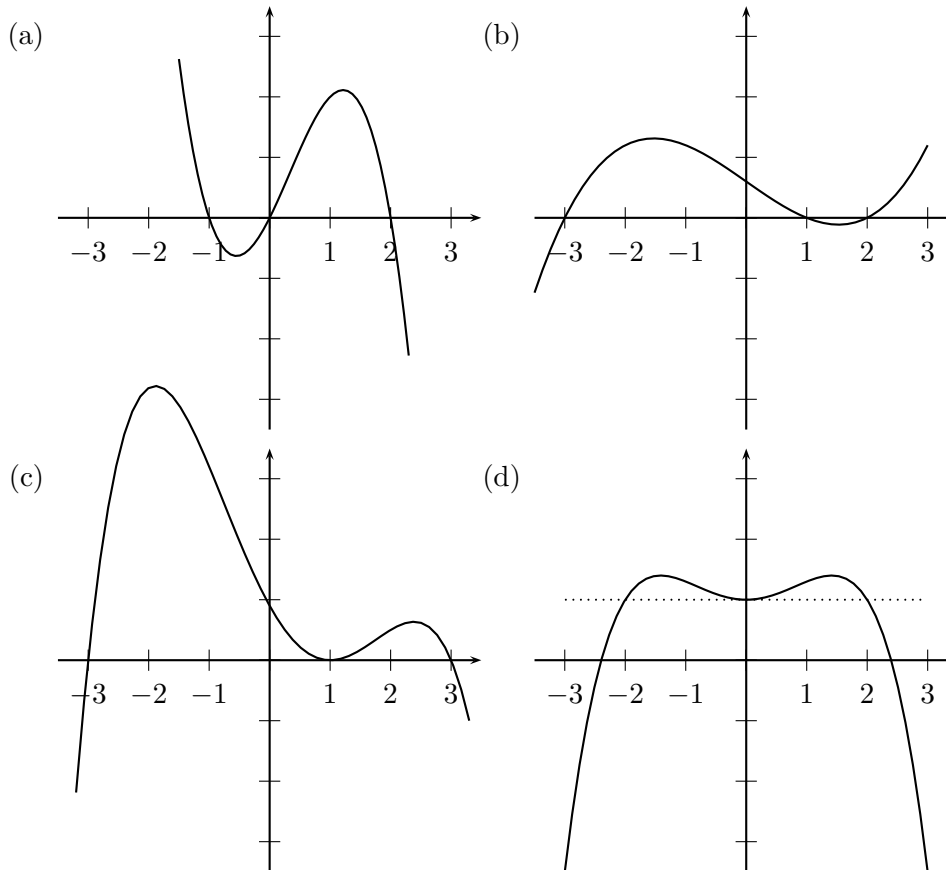
4. For each of the graphs below, determine the minimal possible degree of the polynomial, and whether the leading coefficient of the polynomial is positive or negative:



5. For each of the functions below, describe what happens to $f(x)$ as $x \rightarrow \pm\infty$:

- (a) $f(x) = e^x$,
 (b) $f(x) = x^2 + x + 1$,
 (c) $f(x) = 12 + 3x^2 + 4x^3 - 3x^4$,
 (d) $f(x) = \frac{2x^2 - 13x + 4}{3x^2 + 1}$.

6. Find possible formulae for each of the polynomial functions below:



7. For each of the following functions,

$$f(x) = \frac{x-1}{x^2+1}, \quad g(x) = \frac{x^2-1}{x^2+1}, \quad h(x) = \frac{x^2+1}{x^2-1},$$

Decide which of the following descriptions apply:

- (a) The function has a horizontal asymptote at $y = 1$,
- (b) The x -axis is a horizontal asymptote for the function,
- (c) The function is symmetrical about the y -axis,
- (d) The function is odd,
- (e) The function has vertical asymptotes at $x = \pm 1$.

8. Given a person's weight w in kg and height h in cm, an approximate formula for their surface area s in m^2 is given by

$$s = 0.01w^{0.25}h^{0.75}.$$

- (a) What is the approximate surface area of a person who weighs 75kg and is 170cm tall?
- (b) What is the approximate weight of a person who is 178cm tall and has a surface area of 1.6m^2 ?
- (c) For people who weigh 70kg, solve for h as a function of s . Fully simplify your answer.