

**MATHEMATICS**  
**Monday November 9 2015**  
**Seventh Exercise Class**

1) Calculate the first derivative of each of the following functions:

$$y = f(x) = \frac{x^3 + 2x - 4}{x^2 + x - 4}$$

$$y = f(x) = \sqrt{\log x + 1}$$

$$y = f(x) = \frac{\log(1 + x^2)}{x + 1}$$

$$y = f(x) = e^{\sqrt[3]{x-2}}$$

$$y = f(x) = x^2 \sin \sqrt{x}$$

$$y = f(x) = e^{2x}(2 \sin 3x - 4 \cos 3x)$$

$$y = f(x) = e^{\frac{x+2}{x-3}}$$

$$y = f(x) = (\cos x + x) \cdot (2 \sin x + 3)$$

$$y = f(x) = (x^3 + 4x)^4$$

$$y = f(x) = \sqrt{\frac{x^2 - x}{4x + 5}}$$

$$y = f(x) = \ln \left( \frac{e^x - 2}{e^x + x} \right)$$

$$y = f(x) = \frac{2e^x}{e^x - e^{-x}}$$

$$y = f(x) = e^{\frac{x}{-1 + \log x}}$$

2) Given the following functions, for each:

- a. Find the domain, the axis intercepts and study the sign of f
- b. Find, if they exist, horizontal and vertical asymptotes
- c. Calculate  $f'(x)$ . Determine the intervals in which the function increases or decreases. Find (if they exist) local maxima and minima.
- d. Draw the graph of the function

$$y = f(x) = \frac{x-1}{x^2-x-6}$$

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

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

$$y = f(x) = \sqrt{x+3}e^{-(x+3)}$$

$$y = f(x) = e^{-x} - e^{-3x}$$

$$y = f(x) = \sqrt[3]{(x-1)(x-2)^2}$$

$$y = f(x) = e^{\sqrt[3]{x-2}}$$

$$y = f(x) = xe^{\frac{x-1}{x+1}}$$

$$y = f(x) = \frac{\log x}{x}$$

$$y = f(x) = x \frac{2 \log x - 3}{\log x - 2}$$

$$y = f(x) = \log_{\frac{1}{2}} \left( \frac{x^2 - 5x}{4 - x} \right)$$

$$y = f(x) = \left| \frac{1-x^2}{x^2+1} \right|$$