# Homework Set 4

DUE: OCT 10, 2018 (AT THE BEGINNING OF CLASS)

**To be handed in**

*Please write your solutions to Problems 1 and 2 on only 1 sheet of paper.*

1. a) Show that the derivative of $f(x) = x^3$ is equal to $f'(x) = 3x^2$ **using the definition as a limit** of a difference quotient.
   HINT: Remember that $a^3 - b^3 = (a-b)(a^2+ab+b^2)$.
   b) Find the equation of the tangent line to $f(x) = x^3$ at the point $(1, 1)$.

2. Compute the following derivatives:
   a) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(x^4 - 3x^3 + 2x^2 + x - 1\right)$
   b) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(\sqrt{x} + \dfrac{\sqrt{3}}{\sqrt{x}} + \sqrt{3}\right)$
   c) $\dfrac{\mathrm{d}}{\mathrm{d}\theta}\left(\sin\theta + \cos\theta\right)$
   d) $\dfrac{\mathrm{d}}{\mathrm{d}t}\left(e^t + 4t^2 + 3\right)$
   e) $\dfrac{\mathrm{d}}{\mathrm{d}t}\left(\dfrac{1}{t^2} - 4\sin t + t^{4/5}\right)$

3. Textbook (5th edition) Section 3.2, Exercises 5-14, 23-26, 41-44, 55- 56, 69-72, 111, 112.