MS-A0211 - Differential and integral calculus 2, period III, 2020 David Radnell

HW 1: Due: 14.01.2020

Here are some review problems from calculus and analytic geometry to be submitted on Thursda. Please remember that clear and logical mathematical writing is important.

1. Calculate the following derivatives.
   (a) $\frac{d}{dx}(\sin^4(2x))$
   (b) $\frac{d}{dt}(t^3 \cdot e^{-2t})$
   (c) $\frac{d}{du}(u \cdot \sqrt{1+u^2} + \ln(u + \sqrt{1+u^2}))$
2. Calculate the following integrals.
   (a) $\int (x^3 + x^{1/3})\, dx$
   (b) $\int_0^{\pi/2} \cos^3(t) \sin^2(t)\, dt$
   (c) $\int_0^{\infty} ye^{-y}\, dy$
3. Sketch the region bounded by the two parabolas $x = y^2$ and $y = x^2/8$, and calculate its area.
4. Sketch the curves
   (a) $x^2 - y^2 = 1$. What is this curve called?
   (b) $y = x\sin(x)$
   (c) $x(t) = 3\cos(t), y(t) = 5\sin(t)$ for $0 \leq t \leq 2\pi$. What is this curve called?
   (d) $x(t) = t\cos(t), y(t) = t\sin(t), z(t) = t$ for $0 \leq t \leq 7\pi$
5. Find the equation of the line passing though the points $(0, 1, 1)$ and $(3, 4, -1)$.
6. Find the equation of the plane passing through the points $(1, 0, 0), (0, 2, 0)$ and $(0, 0, 1)$. Sketch the plane.