MA1M01 Calculus Assignment 4
Michælmas term week 6

1. [**40 points**] Differentiate the following functions with respect to x.

    (a) $f(x) = (2x + 7)^{10}$

    (b) $g(x) = \sqrt{x + 5}$

    (c) $h(x) = \frac{2}{\sqrt{x}} + 8x^3$

    (d) $m(x) = f(g(x - 5) - \frac{7}{2})$

2. [**20 points**]

    (a) Compute $\int (17x + a)^8 \, dx$ (where a is some number).

    (b) Find a function $f(x)$ such that $f'(x) = x\sqrt{x^2 + 2}$ and $f(0) = 0$.

3. [**15 points**] Compute the following integrals.

    (a) $\int_{-2}^{6} dx$

    (b) $\int_{0}^{3} x \, dx$

    (c) $\int_{-3}^{0} -x \, dx$

4. [**15 points**] The absolute value function is defined as

$$|x| = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases} .$$

    (a) Graph $|x|$ for $-3 < x < 3$.

    (b) Calculate $\int_{-3}^{3} |x| \, dx$. (*Hint: use the results of the previous question.*)

5. [**10 points**] What is the area under the curve

$$f(x) = x^3 \sqrt{x^4 + 1}$$

between $x = -1$ and $x = 2$?

Homework is due one week from when it is given in the tutorial you are assigned to. This set should be handed up in week 8.