Worksheet 4
Derivation

Exercise 1 *Let f be the function defined by $f(x) = \frac{1}{x+1}$.*

a. Find the slope of the tangent line to the curve $y = f(x)$ at the point $(0, 1)$

b. Find an equation of the tangent line to the curve $y = f(x)$ at the point $(0, 1)$

c. Draw the graph of f and the tangent line at the point $(0, 1)$.

Exercise 2 *Find the following limits. Hint: note that it can be written as the derivative of some function at some point.*

a) $\lim_{u\to 1} \dfrac{\sqrt[3]{u} - 1}{u - 1}$ *b)* $\lim_{x\to 0} \dfrac{\sin x}{x}$ *c)* $\lim_{t\to 1} \dfrac{t^{100} - 1}{t - 1}$

Exercise 3 *Differentiate the function*

a) $f(x) = (3 - 4x^2)(x^3 - 1)$ *b)* $g(\theta) = \theta \cos\theta$ *c)* $q(\alpha) = \sqrt{\alpha} - \dfrac{1}{2\sqrt{\alpha}}$

d) $h(r) = \dfrac{r}{r^2 + 1}$ *e)* $f(a) = \cos(a)\sin(a)$ *f)* $a(x) = \dfrac{\sin x}{\cos x}$