## NCEA Level 3 Calculus (Differentiation) 14. Differentiation Revision (Homework)

## Reading

## Go and watch...

https://www.youtube.com/watch?v=fIaupXkpB00

## Questions

1. Find f' in each case:

(a) 
$$f(x) = 3x^{2017} + \frac{1}{x^{19}} + \sqrt[2017]{x+2}$$

(b) 
$$f(h) = \pi r^2 h$$

(c) 
$$f(\theta) = \frac{\mu mg}{\mu \sin \theta + \cos \theta}$$

(d) 
$$f(g) = \frac{\sin g}{g^2 + \ln g}$$

(e) 
$$3x \cdot f(x) + [f(x)]^2 = \frac{x}{3+f(x)}$$

- 2. A kite  $50\,\mathrm{m}$  above the ground moves horizontally at a speed of  $2\,\mathrm{m\,s^{-1}}$ . At what rate is the angle between the string and the horizontal decreasing when  $100\,\mathrm{m}$  of string has been let out?
- 3. A cone-shaped paper drinking cup is to be made to hold  $27 \,\mathrm{cm}^3$  of water (or other liquid beverage). Find the height and radius of the cup that will use the smallest amount of paper.
- 4. Find the closest point on the hyperbola  $x^2 2x y^2 = 2$  to the following points. You may find it useful to complete the square and parameterise the hyperbola (it's easier than dealing with solving the hyperbola equation for x or y).
  - (a) (2,1).
  - (b) (3,1).