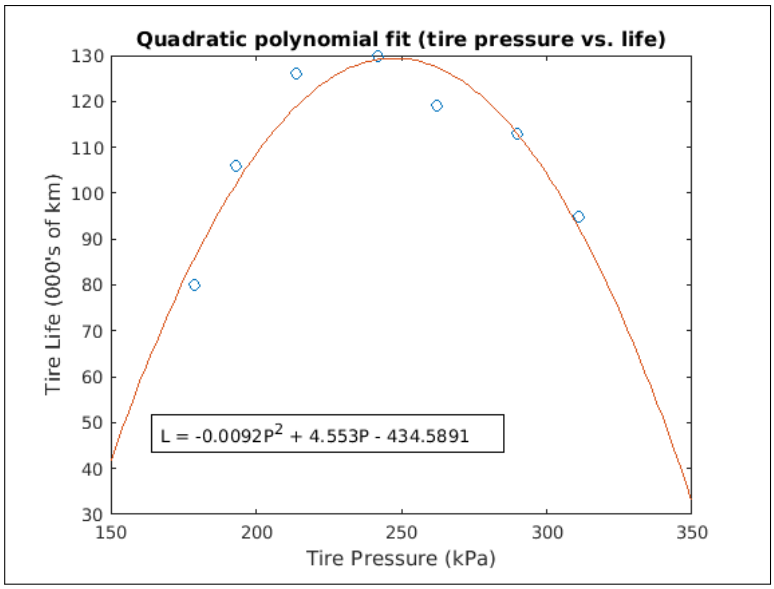
NCEA Level 2 Mathematics (Calculus)

1. Differentiate the function. [Ste 2.3.1-10]
   (a) $f(x) = 186.5$
   (b) $f(x) = \sqrt{30}$
   (c) $f(x) = 5x - 1$
   (d) $F(x) = -4x^{10}$
   (e) $f(x) = x^3 - 4x + 6$
   (f) $f(t) = \frac{1}{2}t^6 - 3t^4 + t$
   (g) $g(x) = x^2(1 - 2x)$
   (h) $h(x) = (x - 2)(2x + 3)$
   (i) $y = x^{-2/5}$
   (j) $B(y) = cy^{-6}$

2. Car tires need to be inflated properly because overinflation or underinflatioon can cause premature treadware. The graph shows tire life L (in thousands of kilometres) for a certain type of tire at various pressures P (in kPa), as well as a quadratic function that models the tire life. [Ste 2.3.66(b)]



   Use the model to estimate $\frac{dL}{dP}$ when $P = 200$ and when $P = 300$. What is the meaning of the derivative? What is the significance of the sign of the derivatives?

3. Find the nth derivative of each function by calculating the first few derivatives and observing the pattern that occurs. [Ste 2.3.86]
   (a) $f(x) = x^n$
   (b) $f(x) = \frac{1}{x}$