

## Assignment #2

MCV4U

Due Date: TBD

### Instructions:

Complete each question on a separate sheet of paper. Each question is worth 10 marks. Only some questions will be marked.

- Let  $f(x) = \frac{2x+1}{x-1}$ 
  - Find  $f'(x)$  using 1st principles.
  - Check your solution by taking the derivative using the product rule.
  - Check your solution using the quotient rule.
  - Find any critical points on  $f(x)$ .
  - Find the equation of the tangent to  $f(x)$  at  $x = 4$ .
- Find the derivative of each of the following. Simplify appropriately.
  - $y = (1 - 2x^3)(x^2 - 2)^2$
  - $y = 3x^3\sqrt{3x^2 - 1}$
  - $y = \frac{3x^2 - x}{2x^2 - x}$
  - $f(x) = \sqrt{\frac{2x-1}{x^3}}$
- Find all critical points of the curve  $f(x) = x^4(3x - 1)^6$ .
  - At what point(s) on the curve  $f(x) = \frac{4x+8}{x+1}$  is the tangent line perpendicular to the line  $x - 4y + 8 = 0$ ?
- The gas tank of a parked pickup truck develops a leak. The amount of gas, in litres, remaining in the tank after  $t$  hours is represented by the function  $V(t) = 90\left(1 - \frac{t}{18}\right)^2$ .
  - Suggest a suitable domain and range for this function.
  - How fast is the gas leaking from the tank after 12 hours?
  - How fast is the gas leaking from the tank when there are 40 L of gas in the tank?
- Find the equation of any tangent(s) to the graph of  $f(x) = -x^2 + 6x + 5$  that also go through the point (3, 18).
  - Show that the function  $y = \frac{5x+2}{x+2}$  is always increasing.
- The graphs of  $f(x) = x^2 + 5$  and  $g(x) = -x^2 + 2$  share two common tangent lines. Find the equations of these tangents. Express your equations in  $y=mx+b$  form.