1. Use the Quotient Rule to determine the equation of the derivatives of the following functions:

   a. $y = \frac{e^x}{1 - e^{2x}}$ b. $y = ln\left(\frac{x+1}{x-1}\right)$ c. $y = \frac{1 + ln(x)}{x}$ d. $y = \frac{sin\, x}{1 + cos\, x}$

Here are some videos if you need more explained examples
https://www.youtube.com/watch?v=wg2O3o4s1q0
https://www.youtube.com/watch?v=lnq4V8Vogxc

2. Find the equations of the tangents to the curve $y = \frac{4x}{x^2 + 1}$ at the points where $x = 0$ and $x = 1$.

3. Find the equation of the second derivative of the following functions:

   a. $y = \frac{1}{x+1}$ b. $y = \frac{cos(4x)}{e^x}$ c. $y = \frac{x^2}{x^2+1}$

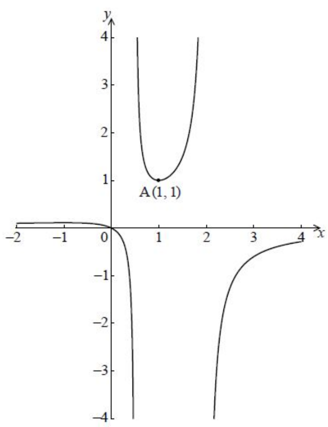
4. Given the function $g(x) = \frac{e^x}{x},\ x \neq 0$;

   a. Predict what is happening on the graph at $x = 0$. Explain why.
   b. Predict whether or not this function has a horizontal asymptote. To check your prediction, estimate the values of $g(100)$ and $g(-100)$.
   c. Determine the coordinates of all/any stationary points.
   d. Determine the intervals of increase and decrease.
   e. Sketch the function.

5. Use the second derivative to determine the nature of the stationary points of:

   a. $y = \frac{x}{x^2 - 1}$ b. $y = \frac{\sqrt{x}}{x-1}$

6. Let $f(x) = \frac{x}{-2x^2 + 5x - 2}$ for $-2 \leq x \leq 4,\ x \neq \frac{1}{2}, x \neq 2$. The graph of f is shown here. The graph a local minimum at A(1,1) and a local maximum at B.



   a. Use the quotient rule to show that $\frac{d}{dx} f(x) = \frac{2x^2 - 2}{(-2x^2 + 5x - 2)^2}$.
   b. Hence, find the coordinates of B.
   c. Given that the line $y = k$ does not meet the graph of f, find the possible values of k.

7. Further Practice ⇒ https://maths.mq.edu.au/numeracy/web_mums/module4/Worksheet41/module4.pdf on page 6