1. Use the rules to fnd the derivative of each function. No need to "simplify".

$(i)\quad y = f(x) = \dfrac{1}{\left(x^4 - 4x^3 + 8\right)^3}$

$(ii)\quad y = f(x) = \tan^{-1}\left(e^{x^2}\right)$

$(iii)\quad y = f(x) = \ln\left(\ln\left(\ln\left(4x^2\right)\right)\right)$

$(iv)\quad y = f(x) = \ln\left(\sqrt{x}\right)\sqrt{\ln x}$

$(v)\quad y = f(x) = \sin^{-1}(2x)\ \sin 2x$

$(vi)\quad y = f(x) = e^{e^{9x}}$

$(vii)\quad y = f(x) = \left(x^3 + 3x + 1\right)^5\left(x^4 - 3x^3 + 1\right)^4$

2. Let $y = f(x) = 2x^5 + x^3 + 1$. Let $g(x) = f^{-1}(x)$, the **inverse** function of $f(x)$. Find $g'(4)\ \left[= f^{-1}{}'(4)\right]$

3. Find the equation of the line tangent to the graph of $x \ln y + e^{xy} - y = 0$ at the graph point $(0,1)$.

4. Use linearization (the tangent line) to estimate the number $\sqrt[3]{1001}$.
(Decimal answer is neither required nor desired)

5. Find $\frac{dy}{dx} = f'(x)$ if $y = f(x) = \frac{\left(x^2-8\right)^{\frac{1}{3}}\sqrt{x^3+1}}{\left(x^6-7x+1\right)e^x}$

6.

Values of functions f, g, f', and g' are given in the table below:

x	-1	0	1	2
f	11	7	5	5
g	-3	2	-1	1
f'	1	3	4	7
g'	2	1	5	2

If $h(x) = f(g(x))$, what is $h'(1)$?

7. A conical water tank with vertex down has a radius of 10 ft at the top and is 24 ft high. Water flows ino the tank at a rate of 20 ft^3per minute. How fast is the depth of the water increasing when the water is 16 ft deep?

Note: The volume of a (right, circular) cone is $V = \frac{1}{3}\pi r^2 h$