Problem 1. Find the derivative $\left(ie\ \frac{df}{dx}\right)$ for the following:

(1) $f(x) = (4x^2 - 2x + 5)^{10}$

(2) $f(x) = 5x^3e^x + 2^x$

(3) $f(x) = e^{5x^2}$

(4) $f(x) = \log_2(x^2e^{-x})$

(5) $f(x) = \ln(\sqrt{x^2 - 5})$

(6) $f(x) = \dfrac{1 + \ln(3x^2)}{1 + \ln(4x)}$

(7) $f(x) = \log_5(3x^4 - 2x)\ e^{3x^2+1}$

(8) $f(x) = \sqrt[3]{e^{x^2} \ln(4x^2 + 2x)}$

Problem 2. Find the equation of the tangent line to the graph of $f(x) = e^{2x-3}$ at $x = 3/2$.

Problem 3. if $f(x) = \ln(x^3 + 2)$ find $f'(e^{1/3})$.

Problem 4. Use implicit differenciation to find $\dfrac{dy}{dx}$ for the following:

(1) $x^2 + xy + y^2 = 7$

(2) $\sqrt{x} + \sqrt{y} = 16$

(3) $x^2 + ye^{xy} = 1$

(4) $\log_{10}(5y^4) - e^{x^2y} = 10$

Problem 5. Differentiate implicitly and find the equation of the tangent line at the given point.

(1) $x^2 + y^2 = 4$ at the point $(1, -\sqrt{3})$.

(2) $\ln(xy) = y^2 - 1$ when $x = 1$.

Problem 6. The price demand function, $p(x) = -(-0.01x - 2)^4 + 303$, , is for a brand of towels. $p(x)$ is the price in dollars, per towel, when there is a demand for x towels.

(1) Find the marginal revenue function.

(2) Find the marginal revenue when 150 towels are sold. Interpret your answer.

Problem 7. A bank account has an initial balance of \$400. The account earns interest at an annual rate of 3.24% per year comppunded continuously. How fast is the account balance growing after 7 years?

Problem 8. Use the table below to answer the following questions

x	-6	0	5	8	64
$f(x)$	30	-6	19	58	4090
$f'(x)$	-12	0	10	16	128
$g(x)$	24	0	35	80	4224
$g'(x)$	-10	2	12	18	130

(1) Find $h'(5)$ if $h(x) = x^2 - 3(g(x))^4$

(2) Find $h'(8)$ if $h(x) = 5f(x)g(x^2)$

(3) Find $h'(x)$ if $h(x) = f(g(f(x) + 3))$