NAME: .....

GRADE: 12

Calculus Final Revision

Part 1 :Answer all of the following questions :-

I. Using the limit definition of the derivative $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ to determine the derivative of $g(x) = x + 3 - 2x^2$ at $x = 1$

II. Use derivative rules to differentiate the following and do not simplify your derivative.

a) $f(x) = 7x^{\frac{5}{7}} - 3x^2 + 7$

b) $g(x) = 16(-5x^2 + \tan x)^{-3}$

c) $h(x) = \frac{6x^2-3}{2x^2+1}$

d) $f(x) = x^4 \cos 4x$

e) $k(x) = (\sqrt[3]{x})(5x^3 - 7)$

III. Find the slope of the tangent to the curve $x^2 + x - 1 = 3y^2 \cot 4x^3$

IV. Find the equation of the tangent to the curve $f(x) = \frac{x^2-1.5x+2}{2x+2}$ at the point $\left(2, \frac{1}{2}\right)$

V. Determine y'' for

a) $y = 4x^7 - 15x^3 + 2x$

b) $2x^3 - 12y^2 + 5 = 0$

VI. Find $\frac{dy}{dx}$ in terms of x and y, where $\frac{3+2x^2}{4y} = 5x^2$.

VII. Find the equation of the tangent to the curve $f(x) = 1 + x \sin x$ at (0,1)

VIII. Find the slope of the tangent to the curve $x^4 + y^4 = x^3 + 4y^3 - 2x$

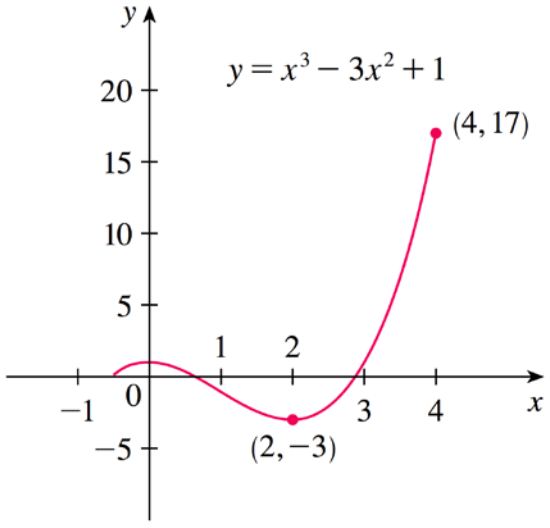
IX. If $f(x) = \sec x$ find $f'\left(\frac{2\pi}{5}\right)$

Part 2 :Answer all of the following questions :-

1) If $f(x) = 3x^2 - x + 2$ find $f'(3a)$
2) If $f(x) = \csc x$ find $f''\left(\frac{\pi}{6}\right)$
3) Air is being pumped into a spherical balloon so that its volume increases at a rate of 150 cm^3/ys. How fast is the radius of the balloon increasing when the radius is 50 cm?
4) If an equation of the tangent line to the curve $y = f(x)$ at the point $a = 2$ is $y = 3x - 3$ find $f'(4)$
5) The equation of motion is given for a particle is $s = t^3 - 3t$, where s is in meters and t is in seconds. Find the acceleration after 8 seconds.

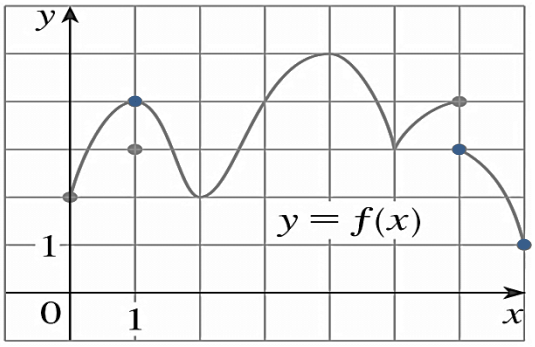
6) $\frac{d}{dX}\left(\frac{d}{dX}(2x^5)\right)$
7) Find the slope of the tangent to the curve $x^4 + y^4 = x^3 + 4y^3 - 2x$
8) $If \quad y = \sqrt{x}\ sinx$ Find y'
9) Use the Quotient Rule to find the derivative of the function $p(t) = \frac{2-t}{6-4t}$
10) using the limit definition of the derivative $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ **to** determine the derivative of $g(x) = -2x + x^2 - 3$ at $x = 1$
11) Find the equation of the tangent to the curve $f(x) = x\cos x$ at the point (0,0)
12) Find the slope of the tangent to the curve $x^2 + 1 = 3y^2 \tan 3x^2$
13) Determine y'' of $2x^3 = 2y^2 + 5$
14) Find the absolute maximum and absolute minimum values of $f(x) = (t^2 - 4)^3$ on the given interval $[-2, 3]$

15) Use the graph to find the absolute maximum and absolute minimum values also to find the local maximum and local minimu
    a) $[2, 4]$
    b) $[0, 2]$



Part 3 :Answer all of the following questions :-

1) If $y = (x^4 + 4x^2 - 2)^{12}$, find y' at $x = 2$
2) A particle moves according to a law of motion $s = 9t - t^2 + 9$, $t > 0$, where t is measured in seconds and s in feet.
   a) What is the velocity after 4 seconds?
   b) When is the particle at rest?
   c) Find the acceleration at 13 second.
3) Find the critical numbers of the function $f(x) = \cos\frac{x}{4}$
4) Explain the difference between an absolute maximum and a local maximum.
5) Use the graph to find the absolute maximum and absolute minimum values, also to find the local maximum and local minimum values in the following intervals
   c) $[0 , 2]$
   d) $[2 , 7]$



6) Find the absolute maximum and absolute minimum values of the function $f(x) = \frac{4}{3}t^3 - 4t^2 - 12t$ on the given interval $[-4 ,13]$

7) Find all numbers C that satisfy the conclusion of the Mean Value Theorem $f(x) = x^3 - 3x + 2$ over $[-2, 2]$

8) Find all numbers C that satisfy that the tangent to the curve of the function $f(x)$ is parallel to the x-axis . Where $f(x) = (x - 4)(2x - 1)$ over $\left[-7 , \frac{3}{2}\right]$

10) For the function $f(x) = 2x^3 - 9x^2 + 12x + 9$ sketch then discuss

11) A water tank has the shape of an inverted circular cone with base radius **150 *cm*** and height **700 *cm*** . If water is being pumped into the tank at a rate of **3 m^3/min**, find the rate at which the water level is rising when the water is **2.5 *m*** deep.

12) Suppose that we have two resistors connected in parallel with resistances R_1 and R_2 measured in ohms (Ω). The total resistance, R is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

Suppose that R_1 is increasing at a rate of $0.4\ \Omega$/min and R_2 is decreasing at a rate of 0.7Ω/min. At what rate is R changing when $R_1 = 80\ \Omega$ and $R_2 = 105\ \Omega$?