Math 2413 Calculus-I **Summer 2018 Exam II**
G-Number- **Name (Print):** _____

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1. (10 points) Find the Equation of Tangent and Normal line for the graph of the function $f(x) = x^4 - 2x^2 + 3$ at $x = 2$. Also find the point at which the Tangent of this graph is horizontal.

2. (12 points) Find the derivative of the following

(a) $f(x) = sin(2x)cos(2x)$

(b) $g(x) = (3x - 4)(x^3 + 5)$

(c) $h(x) = \frac{3x^2-1}{2x+5}$

(d) Find the derivative of the function $f(x)$ at $x = 3$ if it exists

$$f(x) = \begin{cases} x^2 & for \quad x \geq 3 \\ 2x + 3 & for \quad x < 3 \end{cases}$$

(e) $\phi(x) = \sqrt{4 - 3x^2}$

(f) $\psi(x) = \sqrt{\frac{2x}{x+1}}$

3. (15 points) (a) (5 points) Find the derivative of the function $x^3y^3 - y = x$

(b) (10 points) Find the Equation of tangent line to the graph of $x^3 + y^3 = 6xy - 1$ at $(2, 3)$.

4. (10 points) Water is pumped into a cylindrical tank at the rate of 240 cubic inch per second. While the height of the tank is 3 times the radius then at what rate the height is changing when the height is 5 inch. (Note: volume of cylinder is V=$\pi r^2 h$)

5. (13 points) A spherical balloon is inflated with gas at the rate of 800 cubic centimeters per minute. Find the rate of change pf the radius when $r = 30$cm. Explain why the rate of change of the radius of the sphere is not constant even though te rate of change of volume is constant.

6. (10 points) Is the Rolles' Theorem can be applied to $f(x) = (x-2)^2(x-3)$ on the interval $[2,3]$ or Not? Give reason. If Rolle's Theorem can be applied, find all numbers c in the open interval (2,3)such that $f'(c) = 0$.

7. (10 points) Find the Absolute extrema of the function on the closed interval [-2,1]

$$g(x) = \frac{6x^2}{x-2}$$

8. (10 points) Find the point on the interval (0, 6) at which the tangent line is parallel to the secant line of the graph $f(x) = x^2 - 2x + 2$.

9. (10 points) Find all the critical points of the function $f(x) = 2sin(x) - cos(2x)$ [Note: Sin(2x)-2sin(x)cos(x)].

BonusBonusBonus

10. (5 Bonus points) Evaluate the derivative $y = sin(xy)$