Name: _____ **Exam 2**

Math 151, Calculus I – Crawford **22 October 2019**

- Calculators, books, notes (in any form), cell phones, and any unauthorized sources are ***not*** allowed.
- You may use the attached unit circle. Simplify trigonometric functions at all standard values.
- Clearly indicate your answers.
- ***Show all your work*** – partial credit may be given for written work.
- ***Good luck***!

	Score
1	/12
2	/16
3	/12
4	/14
5	/8
6	/14
7	/12
8	/14
Total	/100

1. (12 pts). Find an equation of the tangent line to $f(x) = x(x^2 + 1)^3$ at $x = 1$.

2. (16 pts). Differentiate the following [**Do not simplify!**]

(a). $g(\theta) = \sin^4(2\theta)$

(b). $y = \sqrt{\dfrac{5x-1}{x^2+4}}$

3. (12 pts). Use implicit differentiation to find y' for the given curve.

$x^2 + \tan y = y + xy^3$

4. (14 pts). Given $f(x) = \sqrt{x}$

(a). Find the linearization $L(x)$ at $x = 64$.

(b). Use the linearization from part (a) to approximate $\sqrt{64.2}$. i.e. Use $L(x)$ to approximate $f(64.2)$.

[You do **not** need to simplify the approximation in part (b).... Seriously, don't simplify it.]

5. (8 pts). Newtons Law of Gravitation says that the magnitude F of the force exerted by a body of mass m on a body of mass M is

$F = \dfrac{GmM}{r^2}$ where G is the gravitational constant and r is the distance between the bodies.

(a). Find and simplify $\dfrac{dF}{dr}$.

(b). Explain (briefly) the meaning of $\dfrac{dF}{dr}$.

6. (14 pts). A plane flying horizontally at an altitude of 5 mi and a speed of 480 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when the distance from the plane to the station is 6 mi.

[Remember that significant partial credit will be given for clearly and accurately labeling the picture, and indicating values and equations in correct mathematical notation.]

[Include units in your answer.]

7. (12 pts). Given $f(x) = (x^2 - 1)^3$ find the <u>absolute</u> maximum and absolute minimum values of f on the closed interval $[-1, 2]$.

8. (14 pts). Given $f(x) = 2x^4 - 3x^2 + 4$,

(a). Find all intervals on which f is concave up or down.

(b). Find the location(s)(i.e. x-coordinate(s)) of all inflection points. [Do not find the y-coordinate(s).]