NAME:

Spring 2020 Math 1201 Exam 2

Instructions: WRITE YOUR NAME CLEARLY. Do as many problems as you can for a maximal score of 100. SHOW YOUR WORK!

1. If $h(x) = \sqrt{4 + 3f(x)}$, where $f(1) = 7$ and $f'(1) = 4$, find $h'(1)$. [10 pts]

2. Find the derivative of $\left[\cos\left(\frac{x}{x+1}\right)\right]^3$ [10 pts]

3. Let $y(x)$ be given implicitly by the equation $sin(xy) = y$. Find an equation of the tangent line at the point $\left(\frac{\pi}{2}, 1\right)$.

[10 pts]

4. Find the derivative for the function $y = x^x$. [Hint: Use logarithmic differentiation] [10 pts]

5. Calculate $\lim_{x\to 0}(1-4x)^{1/x}$ [10 pts]

6. An aircraft is climbing at a 30° angle to the horizontal. How fast is the aircraft gaining altitude if its speed is 500 mi/hr? [10 pts]

7. Use linear approximation to estimate the value of $\sqrt{99.8}$ [10 pts]

8. If $f(1) = 10$ and $f'(x) \geq 2$ for $1 \leq x \leq 4$, how small can $f(4)$ possibly be? [10 pts]

9. Calculate $\lim_{x \to (\pi/2)^+} \frac{\cos x}{1 - \sin x}$ [10 pts]

10. Express the number 10 as a sum of two nonnegative terms whose product is as large as possible. [10 pts]

Extra-Credit

11. Establish the derivative formula for the function $\mathbf{y = sec^{-1}(x)}$ by using implicit differentiation. [10 pts]

12. Calculate $\lim_{h\to 0} \dfrac{\sqrt{1+2h} - \sqrt{1-4h}}{h}$ [10 pts]