Math 106, Spring 2023

Homework #4

Due **Friday, February 10th** in Gradescope by 11:59 pm ET

Goal: More Trig Derivatives and Review Related Rates with Trigonometry

For $\#1-5$, compute the Derivative for each of the following functions. Do **Not** simplify.

1. $f(x) = \cos(3x) \cdot \tan(1-x^2)$

2. $y = \sqrt{\cos\sqrt{x}}$

3. $f(x) = \cos(\sin(\cos x))$

4. $y = \left(\dfrac{\cos(7x)}{\sin(8x)}\right)^6$

5. $f(x) = \sin\left(\tan\left(\sqrt{9+x^8}\right)\right)$

6. If $g(x) = x\sin x$, find $g''(\pi)$

7. Consider $G(x) = 4\sin^2 x$. Compute $G'\left(\dfrac{\pi}{6}\right)$. Simplify. Hint: Prep $\sin^2 x = (\sin x)^2$

8. Let $W(x) = \cos^2(2x) + 3\sec x$. Compute $W'\left(\dfrac{\pi}{6}\right)$. Simplify.

9. Given $y = 2\sin x + 3\cos x$, show that the function satisifes $y'' + y = 0$.

10. Compute $\dfrac{dy}{dx}$ when $\tan y + \sin x = x^2 - 5y^3$. Hint: Use Implicit Differentiation.

Related Rates with Trigonometry: Give a full detailed and labeled solution for these word problems.

11. A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 feet per second, how fast is the angle between the ladder and the wall changing when the bottom of the ladder is 4 ft from the wall?

12. A kite 10 ft above a fixed point P on the ground moves horizontally at a speed of 4 feet per second. At what rate is the angle between the string and the horizontal *decreasing* when 20 ft of string has been let out?

REGULAR OFFICE HOURS

Monday: 12:00–3:00 pm

Tuesday: 1:00–4:00 pm

7:30–9:00 pm TA Ellerman, SMUDD 204

Wednesday: 1:00-3:00 pm

Thursday: none for Professor

7:30–9:00 pm TA Ellerman, SMUDD 207

Friday: 12:00–2:00 pm

• Related Rates with Trig functions keeps the same Related Rates Structure but uses different Equations. Label your steps.