Math 106, Spring 2023

Homework #3

Goal: More Trigonometry, Angles & Trigonometric Derivatives (including the Chain Rule).

For #1 − 2, evaluate the following Trig expressions, keeping $0 \leq \theta < \dfrac{\pi}{2}$

1. If $\sin \theta = \dfrac{1}{2}$, find $\cos \theta$ 2. If $\cos \theta = \dfrac{2}{5}$, find $\tan \theta$

For #3 − 4, use the facts $\boxed{\dfrac{d}{dx} \sin x = \cos x}$ and $\boxed{\dfrac{d}{dx} \cos x = -\sin x}$ to prove that

3. $\boxed{\dfrac{d}{dx} \tan x = \sec^2 x}$ and   4. $\boxed{\dfrac{d}{dx} \sec x = \sec x \tan x}$ **Memorize.**

For #5 − 6, solve for angle(s) θ in Radians keeping $0 \leq \theta < 2\pi$.

5. $\sin \theta = -\dfrac{1}{2}$ 6. $\sin \theta = -\dfrac{\sqrt{3}}{2}$

For #7 − 8, compute the following values. Justify. Show work on the Unit Circle/Trig Triangles.

7. $\cos \dfrac{4\pi}{3}$ 8. $\sin \dfrac{4\pi}{3}$

For #9 − 17, compute the Derivative for each of the following functions. Do **Not** simplify.

9. $y = \sin \left(x^2 - 5x + 8\right)$ 10. $f(x) = \sin^2 x$ 11. $y = \cos^6(3x)$

12. $y = \cos \sqrt{x}$ 13. $y = \sqrt{\cos x}$ 14. $f(x) = \dfrac{\cos(3x)}{\sin(4x)}$

15. $y = \tan \left(\dfrac{1}{x}\right)$ 16. $f(x) = \dfrac{1}{\tan x}$ 17. $y = \left(\dfrac{\cos x}{x^2 - \sin x}\right)^8$

18. Let $G(x) = \sin(2x) - \cos(3x)$. Compute $G'\left(\dfrac{\pi}{6}\right)$. Simplify your answer completely.

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

• Weve finished a solid review of Trigonometry, and derivatives from Math 105. Aim to make clearer and neater solutions this week.

• Attend Office Hours regularly, both with Professor Benedetto and Math Fellow Ellerman Mateo.