U3H1

Find the slope of the function for any point x.

1. $y = 2\sin x - \tan x$

2. $y = x\sec x$

3. $y = \dfrac{4}{\cos x}$

4. $y = 4 - x^2 \sin x$

5. $y = \dfrac{\csc x}{5\cos x}$

6. $y = \dfrac{\cos x}{1+\sin x}$

7. Find equations for the lines that are tangent **and** normal to the curve $y = \sqrt{2}\cos x$ at the point $(\frac{\pi}{4}, 1)$.

8. Find equations for the lines that are tangent **and** normal to the graph of $y = \tan(x) + 3$ at $x = \pi$.

9. Is there a value of b that will make

$$g(x) = \begin{cases} x + b, & x < 0 \\ \cos x & x \geq 0 \end{cases}$$

continuous at $x = 0$? Differentiable at $x = 0$? Give reasons for your answer.

10. Find $\dfrac{d^{998}}{dx^{998}}(\cos x)$.

11. Find y'' if $y = x\sin x$.

Answers:

1. $y = 2\cos x - \sec^2 x$

2. $y = \sec x(x\tan x + 1)$

3. $y = 4\sec x \tan x$

4. $y = -x^2 \cos x - 2x\sin x$

5. $\dfrac{\cos x \cot x \csc x + \csc x \sin x}{5\cos^2 x}$

6. $y = \dfrac{-1}{1+\sin x}$

7. tangent: $y - 1 = -(x - \frac{\pi}{4})$

   normal: $y - 1 = (x - \frac{\pi}{4})$

8. tangent: $y - 3 = (x - \pi)$

   normal: $y - 3 = -(x - \pi)$

9. Continuous is b = 1; this will make the two one sided limits equal.

Differentiable: No, because for b = 1, the left hand derivative is 1 and the right hand derivative is 0.

10. $\dfrac{d^{998}}{dx^{998}}(\cos x) = -\cos x$

11. $y'' = -x\sin x + 2\cos x$