

MATH 110-003 200730 Quiz 3 Solutions

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1. By the product rule and the chain rule,

$$f'(a) = 2a \cos \frac{1}{a} + a^2 \cdot -\sin \frac{1}{a} \frac{d}{da} a^{-1} = 2a \cos \frac{1}{a} - a^2 \sin \frac{1}{a} \cdot -a^{-2} = 2a \cos \frac{1}{a} + \sin \frac{1}{a}$$

The answer applies for all values of a in the domain of f where it makes sense, i.e., for all $a \neq 0$.

2. The tangent is horizontal where $y' = 0$, so we calculate the derivative and set it equal to 0:

$$y' = \frac{(2 + \cos x) \cos x - \sin x \cdot -\sin x}{(2 + \cos x)^2} = \frac{2 \cos x + \cos^2 x + \sin^2 x}{(2 + \cos x)^2} = \frac{2 \cos x + 1}{(2 + \cos x)^2}$$

where the Pythagorean identity $\cos^2 x + \sin^2 x = 1$ was used to simplify the result. Then $y' = 0$ implies

$$\frac{2 \cos x + 1}{(2 + \cos x)^2} = 0 \implies 2 \cos x + 1 = 0 \implies x = \pm \frac{2\pi}{3} + 2k\pi, k = 0, \pm 1, \pm 2, \dots$$