Name: Solutions

MAC 2311 - Analytical Geometry and Calculus I
Quiz # 5, October 5, 2023

(3) **Problem 1** a.) Given the function

$$f(x) = \frac{tan(x)+1}{e^x}.$$

What is the value of $f'(0)$? (2 out 3 marks if f' correctly calculated but $f'(0)$ incorrect)

A.) -2

B.) -1

C.) 0

D.) 1

E.) 2

$f'(x) = \dfrac{(sec^2(x))(e^x) - (tan(x)+1)(e^x)}{(e^x)^2}$, (1 point, quotient rule)

1 point, trigonometric derivative

• $tan(x) = sec^2(x)$

$f'(0) = \dfrac{sec^2(0) - (0+1)}{1} = 0$

(3) b.) Given

$$g(x) = (\sqrt{1+cos(x)}\ )^3.$$

What is $g'(\frac{\pi}{3})$

A.) $\frac{-9}{4\sqrt{2}}$

B.) $4\sqrt{3}$

C.) $\frac{2\sqrt{3}}{\sqrt{2}}$

D.) $\frac{-4\sqrt{3}}{3\sqrt{2}}$

E.) $\frac{4}{\sqrt{3}}$

(trigonometric derivs 1 point)

, (1 point chain rule)

$g(x) = (1+cos(x))^{3/2}$

$g'(x) = \frac{3}{2}(1+cos(x))^{\frac{1}{2}} \cdot (-sin(x))$

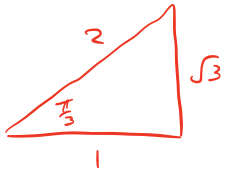
$g'(\frac{\pi}{3}) = \frac{3}{2}(1+cos(\frac{\pi}{3}))^{\frac{1}{2}} \cdot (-sin(\frac{\pi}{3}))$

$= \frac{3}{2}\sqrt{1+\frac{1}{2}} \cdot (-\frac{\sqrt{3}}{2})$

$= \frac{3}{2} \cdot \frac{\sqrt{3}}{\sqrt{2}} \cdot (-\frac{\sqrt{3}}{2})$

$= \boxed{\frac{-9}{4\sqrt{2}}}$

(1 point) $\begin{cases} sin(\frac{\pi}{3}) = \frac{\sqrt{3}}{2} \\ cos(\frac{\pi}{3}) = \frac{1}{2} \end{cases}$



(4)

Problem 2 Find the equation of the tangent line to

$$h(x) = 3sec(x)$$

at the point $x = \frac{\pi}{4}$.

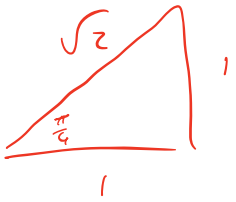
$h'(x) = 3\sec(x)\tan(x)$ (1 point)

Slope: $h'(\frac{\pi}{4}) = 3\sec(\frac{\pi}{4})\tan(\frac{\pi}{4})$

$= 3(\quad)(\quad)$

$= 3(\sqrt{2})(1)$

$= 3\sqrt{2}$ (1 point)



$\cos(\frac{\pi}{4}) = \frac{1}{\sqrt{2}}$ $\tan(\frac{\pi}{4}) = 1$

$\frac{1}{\cos(\frac{\pi}{4})} = \sqrt{2}$

Setup: $y - y_1 = h'(\frac{\pi}{4})(x - x_1)$

Where $y_1 = 3\sec(\frac{\pi}{4}) = 3\sqrt{2}$ (1 point)

$x_1 = \frac{\pi}{4}$

So $y - 3\sqrt{2} = 3\sqrt{2}(x - \frac{\pi}{4})$

$\Rightarrow y = 3\sqrt{2}x + 3\sqrt{2} - 3\sqrt{2}\frac{\pi}{4}$. (1 point)