Topic 3.4 – Differentiating Inverse Trigonometric Functions

Find the derivative of each function.

Oh no! A murder has been committed. Peppa Pig has been found dead and the police have no leads. It is up to you solve this mystery. Solve each of the following multiple-choice questions by taking the derivative of each inverse trigonometric function. Use the space to the right of or just below each problem to show your work. The correct answers will reveal the details of this heinous crime.

Who was the murderer?

1.) $y = \cos^{-1}(3x)$

(A) $y' = -\frac{1}{\sqrt{1-9x^2}}$ **Bart Simpson**

(B) $y' = -\frac{3}{\sqrt{1-9x^2}}$ **Shaggy from Scooby-Doo**

(C) $y' = -\frac{3}{\sqrt{1-3x^2}}$ **Phineas' friend Ferb**

(D) $y' = -\frac{3}{\sqrt{9x^2-1}}$ **Mrs. Morin**

Where did the murder take place?

2.) $y = \sin^{-1}(x^2-1)$

(A) $y' = \frac{2x}{\sqrt{1-(x^2-1)^2}}$ **At Chick-fil-A**

(B) $y' = \frac{1}{\sqrt{1-(x^2-1)^2}}$ **At Olive Garden**

(C) $y' = \frac{2x}{\sqrt{1-(x^2-1)}}$ **At Taco Bell**

(D) $y' = \frac{2x}{\sqrt{(x^2-1)^2-1}}$ **At McDonalds**

What was the murder weapon?

3.) $y = \tan^{-1}(\ln x)$

(A) $y' = \dfrac{1}{1+(\ln x)^2}$ **A foam #1 Hand**

(B) $y' = \dfrac{\frac{1}{x}}{\sqrt{1+(\ln x)^2}}$ **A giant slice of bacon**

(C) $y' = \dfrac{1}{x + x(\ln x)}$ **A light saber**

(D) $y' = \dfrac{1}{x + x(\ln x)^2}$ **A package of Ramen Noodles**

What was the motive of the murder?

4.) $y = \cos^{-1}\left(\sqrt{x}\right)$

(A) $y' = -\dfrac{1}{\sqrt{1-\left(\sqrt{x}\right)^2}}$ **Peppa called the murderer a bad name**

(B) $y' = -\dfrac{1}{\sqrt{x - x^2}}$ **Peppa beat the murderer's high score on Fortnite**

(C) $y' = -\dfrac{1}{2\sqrt{x - x^2}}$ **Peppa ate the murderer's last Nerd Rope**

(D) $y' = -\dfrac{1}{2\sqrt{1-\left(\sqrt{x}\right)^2}}$ **Peppa was eyeing the murderer's significant other**

Where was the murderer apprehended?

5.) $y = \left(\tan^{-1} 2x\right)^5$

(A) $y' = 5\left(\tan^{-1}(2x)\right)^4$ **In a movie theatre watching IT: Chapter 2**

(B) $y' = 5\left(\tan^{-1}(2x)\right)^4 \cdot \dfrac{2}{1+4x^2}$ **In a van, down by the river**

(C) $y' = 5\left(\tan^{-1}(2x)\right)^4 \cdot \dfrac{1}{1+4x^2}$ **In line purchasing a lottery ticket**

(D) $y' = 5\left(\tan^{-1}(2x)\right)^4 \cdot \dfrac{2}{1+2x^2}$ **At a Travis Scott concert**

How did the suspect behave when they were apprehended?

6.) $y = \sin\left(\cos^{-1} t\right)$

(A) $y' = t$ **He cried like a baby**

(B) $y' = -\dfrac{1}{\sqrt{1-t^2}}$ **He said "You will never catch me alive, suckers!"**

(C) $y' = \cos\left(-\dfrac{1}{\sqrt{1-t^2}}\right)$ **He denied any wrongdoing**

(D) $y' = -\dfrac{t}{\sqrt{1-t^2}}$ **He said, "What ever you do….please don't taze me, bro."**

Who will be the presiding judge over the murder's trial?

6.) $y = \sin\left(\cos^{-1} t\right)$

(A) $y' = t$ **Judge Judy**

(B) $y' = -\dfrac{1}{\sqrt{1-t^2}}$ **Aaron Judge**

(C) $y' = \cos\left(-\dfrac{1}{\sqrt{1-t^2}}\right)$ **Judge Rinehold**

(D) $y' = -\dfrac{t}{\sqrt{1-t^2}}$ **Judge Ruth Bader Ginsberg**

What will the murderer's sentence ultimately be?

7.) $y = \arctan\sqrt{x}$

(A) $y' = \dfrac{1}{1+x}$ **10 years hard labor in Mrs. Morin's AP Calculus class**

(B) $y' = \dfrac{1}{2(1+x)}$ **365 days of eating spicy chicken nuggets**

(C) $y' = \dfrac{1}{2x\left(1+x^2\right)}$ **Permanent work release assignment at Taco Bell**

(D) $y' = \dfrac{1}{2\sqrt{x}(1+x)}$ **A lifetime ban of eating bacon**

Who will replace Peppa on her popular British television series?

8.) $y = \sqrt{\cos^{-1} 10x}$

(A) $y' = \frac{1}{2}\left(\cos^{-1}(10x)\right)^{-1/2}$ **The boy who bit Charlie's finger.**

(B) $y' = \frac{1}{2}\left(\cos^{-1}(10x)\right)^{-1/2} \cdot \frac{-10}{\sqrt{1-100x^2}}$ **The member of the band One Direction**

(C) $y' = \frac{1}{2}\left(\cos^{-1}(10x)\right)^{-1/2} \cdot \frac{-1}{\sqrt{1-100x^2}}$ **Kermit the Frog's great nephew.**

(D) $y' = \frac{1}{2}\left(\frac{-10}{\sqrt{1-100x^2}}\right)^{-1/2}$ **Simon Cowell**

What were Peppa Pig's last words before she died?

9.) $y = \left[\sin^{-1}\left(e^{2x}\right)\right]^2$

(A) $y' = 2\left[\sin^{-1}\left(e^{2x}\right)\right] \cdot \frac{2e^{2x}}{\sqrt{1-e^{4x}}}$ **Please don't make me someone's Christmas dinner!**

(B) $y' = 2\left[\sin^{-1}\left(e^{2x}\right)\right] \cdot \frac{e^{2x}}{\sqrt{1-e^{4x}}}$ **Aaaah! Please don't kill me with that ………**

(C) $y' = 2\left[\sin^{-1}\left(e^{2x}\right)\right] \cdot \frac{1}{\sqrt{1-e^{4x}}}$ **No, I will not! I'm not that kind of pig!**

(D) $y' = 2\left[\frac{2e^{2x}}{\sqrt{1-e^{4x}}}\right]$ **I think anyone who eats bacon is absolutely appalling!**