Calculus

Write your questions and thoughts here!

3.4 Differentiating Inverse Trig Functions

Notes

Quote from the AP Exam:
"Notation: The inverse of a trigonometric function x may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$)."

Inverse Trig Derivatives:

$\frac{d}{dx}\sin^{-1}(x) =$	$\frac{d}{dx}\cos^{-1}(x) =$
$\frac{d}{dx}\sec^{-1}(x) =$	$\frac{d}{dx}\csc^{-1}(x) =$
$\frac{d}{dx}\tan^{-1}(x) =$	$\frac{d}{dx}\cot^{-1}(x) =$

Find the derivative.

1. $\frac{d}{dx}\sin^{-1}(3x)$

2. $\frac{d}{dx}\tan^{-1}(2x^2)$

3. $\frac{d}{dx}\operatorname{arcsec}(5x)$

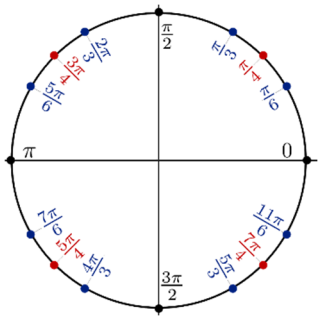
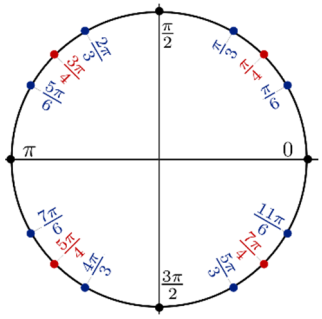
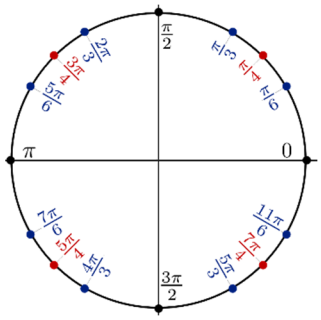
Simplifying $\sec^{-1} x$ Derivatives.

Simplify the following expressions.

4. $\frac{9x^2}{|3x^3|\sqrt{9x^6-1}}$

5. $\frac{4x}{|2x^2|\sqrt{4x^2-1}}$

Domain of an inverse trig function.

$y = \sin^{-1}(x)$	$y = \cos^{-1}(x)$	$y = \tan^{-1}(x)$
		
Domain: $-1 \le x \le 1$ Range: $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$	Domain: $-1 \le x \le 1$ Range: $0 \le y \le \pi$	Domain: $-\infty \le x \le \infty$ Range: $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Write your questions and thoughts here!

Evaluate each function at the given x-value.

6. $f(x) = \arcsin(x)$ at $x = \frac{\sqrt{3}}{2}$

7. $f(x) = \cos^{-1}\left(\frac{x}{4}\right)$ at $x = -2$

8. $f(x) = \arctan(x)$ at $x = \frac{1}{\sqrt{3}}$

3.4 Differentiating Inverse Trig Functions

Calculus

Practice

Find the derivative of each expression.

1. $\frac{d}{dx}\sin^{-1}(5x)$

2. $\frac{d}{dx}\csc^{-1}(4x^5)$

3. $\frac{d}{dx}\arctan(2x)$

4. $\frac{d}{dx}\sec^{-1}(x^3)$

5. $\frac{d}{dx}\csc 6x$

6. $\frac{d}{dx}\arccos(3x^2)$

7. $\frac{d}{dx}\cot^{-1}(-x)$

8. $\frac{d}{dx}\cos^{-1}(-7x)$

9. $\frac{d}{dx}\operatorname{arccsc}(x^6)$

10. $\frac{d}{dx}\cot^{-1}(4x^4)$

Find the tangent line equation of the curve at the given point.

11. $y = \arcsin(x)$ at the point where $x = \frac{\sqrt{2}}{2}$

12. $y = \cos^{-1}(4x)$ at the point where $x = \frac{\sqrt{3}}{8}$

13. $y = \arctan(3x^2)$ at the point where $x = \frac{\sqrt{3}}{3}$

14. $y = \sin^{-1}(5x)$ at the point where $x = -\frac{\sqrt{3}}{10}$

15. $y = \arccos(x)$ at the point where $x = -\frac{\sqrt{2}}{2}$

16. $y = \arctan(x)$ at the point where $x = \sqrt{3}$

3.4 Differentiating Inverse Trig Functions

Test Prep

17. Let $g(x) = (\arccos x^2)^5$. Then $g'(x) =$

(A) $-10\frac{(\arccos x^2)^4}{\sqrt{1-x^2}}$ (B) $-10\frac{x(\arccos x^2)^4}{\sqrt{1-x^4}}$ (C) $-10\frac{x(\arcsin x^2)^4}{\sqrt{1-x^2}}$

(D) $10\frac{x(\arccos x^2)^4}{\sqrt{1-x^2}}$ (E) $10\frac{(\arccos x^2)^4}{\sqrt{1-x^4}}$

---

18. If $\lim_{h\to 0}\frac{\arccos(a+h)-\arccos(a)}{h} = -3$, which of the following could be the value of a?

(A) $\frac{\sqrt{8}}{3}$ (B) $\frac{1}{3}$ (C) 3 (D) 1

---

19. If $\arctan y = \ln x$, then $\frac{dy}{dx} =$

(A) $\tan\left(\frac{1}{x}\right)$ (B) $\tan(\ln x)$ (C) $\frac{1+y^2}{xy}$ (D) $\frac{x}{1+y^2}$ (E) $\frac{1+y^2}{x}$