**Know the following Theorems.**

| | | |
|---|---|---|
| $\dfrac{d}{dx}\left[\sin^{-1}\Box\right]=\dfrac{1}{\sqrt{1-\Box^2}}\cdot\dfrac{d\Box}{dx}$ | $\dfrac{d}{dx}\left[\tan^{-1}\Box\right]=\dfrac{1}{1+\Box^2}\cdot\dfrac{d\Box}{dx}$ | $\dfrac{d}{dx}\left[\sec^{-1}\Box\right]=\dfrac{1}{\left|\Box\right|\sqrt{\Box^2-1}}\cdot\dfrac{d\Box}{dx}$ |
| $\dfrac{d}{dx}\left[\cos^{-1}\Box\right]=\dfrac{-1}{\sqrt{1-\Box^2}}\cdot\dfrac{d\Box}{dx}$ | $\dfrac{d}{dx}\left[\cot^{-1}\Box\right]=\dfrac{-1}{1+\Box^2}\cdot\dfrac{d\Box}{dx}$ | $\dfrac{d}{dx}\left[\csc^{-1}\Box\right]=\dfrac{-1}{\left|\Box\right|\sqrt{\Box^2-1}}\cdot\dfrac{d\Box}{dx}$ |

Find the derivative of $y$ with respect to the appropriate variable.

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

**2.** $y=\sin^{-1}\sqrt{2t}$

**3.** $y=\sin^{-1}\dfrac{3}{t^2}$

**4.** $y=x\sin^{-1}x+\sqrt{1-x^2}$

**5.** $y=\sec^{-1}5s$

**6.** $y=\cot^{-1}\sqrt{t-1}$

**7.** Which of the following is $\dfrac{d}{dx}\sin^{-1}\left(\dfrac{x}{2}\right)$?

A) $-\dfrac{2}{\sqrt{4-x^2}}$    B) $-\dfrac{1}{\sqrt{4-x^2}}$    C) $\dfrac{2}{4+x^2}$    D) $\dfrac{2}{\sqrt{4-x^2}}$    E) $\dfrac{1}{\sqrt{4-x^2}}$

Find the derivative of the function.

**8.** $y=3-7x^3+3x^7$

**9.** $y=\dfrac{2x+1}{2x-1}$

**10.** $y=\cot\dfrac{2}{t}$

**11.** $y=x\sqrt{2x+1}$

**12.** $r=\tan^2\left(3-\theta^2\right)$

**13.** $y=\ln\sqrt{x}$

**14.** $y=xe^{-x}$

**15.** $y=\ln\left(\sin x\right)$

**Answers**

**1.** $y' = -\dfrac{2x}{\sqrt{1-x^4}}$

**2.** $y' = \dfrac{1}{\sqrt{2t}\sqrt{1-2t}}$

**3.** $y' = -\dfrac{6}{t\sqrt{t^4-9}}$

**4.** $y' = \sin^{-1} x$

**5.** $y' = \dfrac{1}{|s|\sqrt{25s^2-1}}$

**6.** $y' = -\dfrac{1}{2t\sqrt{t-1}}$

**7.** E

**8.** $y' = -21x^2 + 21x^6$

**9.** $y' = -\dfrac{4}{(2x-1)^2}$

**10.** $y' = \dfrac{2\csc^2\left(\dfrac{2}{t}\right)}{t^2}$

**11.** $y' = \dfrac{3x+1}{\sqrt{2x+1}}$

**12.** $y' = -4\theta \tan\left(3-\theta^2\right)\sec^2\left(3-\theta^2\right)$

**13.** $y' = \dfrac{1}{2x}$

**14.** $y' = -e^{-x}(x-1)$

**15.** $y' = \cot x$