Calculus Name_____

Derivatives and Integrals of Inverse Trig Functions Date_____ Period____

Differentiate each function with respect to *x*.

1) $f(x) = \tan^{-1}(5x^4 + 3)^3$

2) $f(x) = \csc^{-1} 2x^3$

3) $y = (\cot^{-1} 5x^5)^4$

4) $y = \sin^{-1} 3x^3$

5) $y = \cos^{-1} 2x^2$

6) $f(x) = \sec^{-1}(x^2 + 1)^5$

Evaluate each indefinite integral.

7) $\int \frac{1}{4 + x^2}\, dx$

8) $\int \frac{1}{x\sqrt{x^2 - 9}}\, dx$

9) $\int \frac{1}{x\sqrt{x^2 - 25}}\, dx$

10) $\int \frac{1}{\sqrt{9 - x^2}}\, dx$

11) $\int \frac{2e^{2x}}{\sqrt{25 - e^{4x}}}\, dx$

12) $\int \frac{9x^2}{25 + 9x^6}\, dx$

13) $\int \frac{3e^{3x}}{e^{3x}\sqrt{e^{6x} - 1}}\, dx$

14) $\int \frac{12x^2}{4x^3\sqrt{16x^6 - 9}}\, dx$

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Differentiate each function with respect to *x*.

1) $f(x) = \tan^{-1}(5x^4 + 3)^3$

$$f'(x) = \frac{1}{((5x^4 + 3)^3)^2 + 1} \cdot 3(5x^4 + 3)^2 \cdot 20x^3$$
$$= \frac{60x^3(5x^4 + 3)^2}{(5x^4 + 3)^6 + 1}$$

2) $f(x) = \csc^{-1} 2x^3$

$$f'(x) = -\frac{1}{|2x^3|\sqrt{(2x^3)^2 - 1}} \cdot 6x^2$$
$$= -\frac{6x^2}{|2x^3|\sqrt{4x^6 - 1}}$$

3) $y = (\cot^{-1} 5x^5)^4$

$$\frac{dy}{dx} = 4(\cot^{-1} 5x^5)^3 \cdot -\frac{1}{(5x^5)^2 + 1} \cdot 25x^4$$
$$= -\frac{100x^4(\cot^{-1} 5x^5)^3}{25x^{10} + 1}$$

4) $y = \sin^{-1} 3x^3$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1 - (3x^3)^2}} \cdot 9x^2$$
$$= \frac{9x^2}{\sqrt{1 - 9x^6}}$$

5) $y = \cos^{-1} 2x^2$

$$\frac{dy}{dx} = -\frac{1}{\sqrt{1 - (2x^2)^2}} \cdot 4x$$
$$= -\frac{4x}{\sqrt{1 - 4x^4}}$$

6) $f(x) = \sec^{-1}(x^2 + 1)^5$

$$f'(x) = \frac{1}{|(x^2 + 1)^5|\sqrt{((x^2 + 1)^5)^2 - 1}} \cdot 5(x^2 + 1)^4 \cdot 2x$$
$$= \frac{10x}{\sqrt{(x^2 + 1)^{10} - 1}(x^2 + 1)}$$

Evaluate each indefinite integral.

7) $\int \frac{1}{4+x^2}\,dx$

$\frac{1}{2}\cdot\tan^{-1}\frac{x}{2}+C$

8) $\int \frac{1}{x\sqrt{x^2-9}}\,dx$

$\frac{1}{3}\cdot\sec^{-1}\frac{x}{3}+C$

9) $\int \frac{1}{x\sqrt{x^2-25}}\,dx$

$\frac{1}{5}\cdot\sec^{-1}\frac{|x|}{5}+C$

10) $\int \frac{1}{\sqrt{9-x^2}}\,dx$

$\sin^{-1}\frac{x}{3}+C$

11) $\int \frac{2e^{2x}}{\sqrt{25-e^{4x}}}\,dx$

$\sin^{-1}\frac{e^{2x}}{5}+C$

12) $\int \frac{9x^2}{25+9x^6}\,dx$

$\frac{1}{5}\cdot\tan^{-1}\frac{3x^3}{5}+C$

13) $\int \frac{3e^{3x}}{e^{3x}\sqrt{e^{6x}-1}}\,dx$

$\sec^{-1}e^{3x}+C$

14) $\int \frac{12x^2}{4x^3\sqrt{16x^6-9}}\,dx$

$\frac{1}{3}\cdot\sec^{-1}\frac{4x^3}{3}+C$