Fun with INVERSE TRIG DERIVATIVES AND INTEGRALS **Show your work!**

Solve the equation.

1. $\arcsin(2x-1)=\frac{\pi}{6}$
2. $\frac{3\pi}{4}=\arctan(2x-1)$

Simplify each inverse trig expression.

3. $\arcsin\left(\frac{-\sqrt{3}}{2}\right)$
4. $\arccos\left(-\frac{1}{2}\right)$
5. $\operatorname{arccot}\left(-\sqrt{3}\right)$
6. $\tan\left(\arcsin\frac{1}{3}\right)$

Find the derivative of each.

7. $f(x)=\arccos(x^2-2)$
8. $g(x)=arc\csc(x-2)$
9. $f(x)=\frac{\arctan 2x}{x}$
10. $g(x)=x\arctan x$
11. $g(x)=arc\cot(2x)+\ln(1+4x^2)$
12. $f(x)=\sin(arc\cos x)$
13. $f(x)=x^3\arcsin 3x$
14. $g(x)=arc\sec(e^{3x})$

Find the INTEGRAL of each.

15. $\int\frac{dx}{25+9x^2}$
16. $\int\frac{dx}{\sqrt{1-4x^2}}$
17. $\int\frac{dx}{3+16x^2}$
18. $\int\frac{dx}{\sqrt{9-25x^2}}$
19. $\int\frac{dx}{x\sqrt{4x^2-1}}$
20. $\int\frac{dx}{1+4x^2}$

Recall: Solve the differential equation.

21. $(1+x^2)\frac{dy}{dx}-xy=0$
22. $\frac{dy}{dt}=ky$
23. $\frac{dy}{dx}=\frac{x}{2y}$

Answers

1. ¾
2. 0
3. $-\frac{\pi}{3}$
4. $\frac{2\pi}{3}$
5. $\frac{5\pi}{6}$
6. $\frac{\sqrt{2}}{4}$
7. $\frac{-2x}{\sqrt{-x^4+4x^2-3}}$
8. $\frac{-1}{|x-2|\sqrt{x^2-4x+3}}$
9. $\frac{2x-\left(1+4x^2\right)\arctan 2x}{\left(1+4x^2\right)x^2}$
10. $\arctan x+\frac{x}{1+x^2}$
11. $\frac{8x-2}{1+4x^2}$
12. $\frac{-x}{\sqrt{1-x^2}}$
13. $3x^2\left(\arcsin 3x+\frac{x}{\sqrt{1-9x^2}}\right)$
14. $\frac{3}{\sqrt{e^{6x}-1}}$
15. $\frac{1}{15}\tan^{-1}\left(\frac{3x}{5}\right)+C$
16. $\frac{1}{2}\sin^{-1}(2x)+C$
17. $\frac{1}{4\sqrt{3}}\tan^{-1}\left(\frac{4x}{\sqrt{3}}\right)+C$
18. $\frac{1}{5}\sin^{-1}\left(\frac{5x}{3}\right)+C$
19. $\sec^{-1}(2x)+C$
20. $\frac{1}{2}\tan^{-1}(2x)+C$
21. $y=C\sqrt{1+x^2}$ (this is the toughest one!)
22. $y=Ce^{kt}$
23. $y^2=\frac{1}{2}x^2+C$