Find the derivative:

1. $y = \sqrt[3]{x^2}\sin x$

2. $y = \frac{\tan x}{x^3 + 2}$

3. $y = \left(x^4 + \sin x \cos x\right)^3$

4. $y = \frac{x^3 - 2x}{x + 3}$

5. $y = \left(\sqrt{x^2 - 1} + 1\right)^{10}$

6. $y = \cos\left(x^2\right)\tan\left(\sqrt{x + 1}\right)$

7. $y = \cos\left(\cos\left(\cos\left(3x\right)\right)\right)$

8. $y = \sqrt{\frac{1 + x}{2 - x}}$

9. $y = x^2\left(\sqrt{x} + 2\right)$

10. $f(x) = 2\sqrt{x^2 + 1} + \sin\left(\frac{4\pi}{5}\right)$

Answers

1. $y = x^{\frac{3}{2}} \sin x$

    $y' = \frac{3}{2} x^{\frac{1}{2}} \sin x + x^{\frac{3}{2}} \cos x$

2. $y' = \frac{\sec^2 x \left(x^3 + 2\right) - 3x^2 \tan x}{\left(x^3 + 2\right)^2}$

3. $y' = 3 \left(x^4 + \sin x \cos x\right)^2 \left(4x^3 + \cos^2 x - \sin^2 x\right)$

4. $y' = \frac{\left(3x^2 - 2\right)(x+3) - \left(x^3 - 2x\right)}{(x+3)^2}$

5. $y = \left(\left(x^2 - 1\right)^{\frac{1}{2}} + 1\right)^{10}$

    $y' = 10 \left(\sqrt{x^2 - 1} + 1\right)^9 \frac{1}{2} \left(x^2 - 1\right)^{-\frac{1}{2}} 2x$

6. $y' = -\sin\left(x^2\right) 2x \tan\left(\sqrt{x+1}\right) + \cos\left(x^2\right) \sec^2\left(\sqrt{x+1}\right) \frac{1}{2} (x+1)^{-\frac{1}{2}}$

7. $y' = -\sin\left(\cos\left(\cos\left(3x\right)\right)\right) \cdot \left(-\sin\left(\cos\left(3x\right)\right)\right) \cdot \left(-\sin\left(3x\right)\right) \cdot 3$

8. $y = \left(\frac{1+x}{2-x}\right)^{\frac{1}{2}}$

    $y' = \frac{1}{2} \left(\frac{1+x}{2-x}\right)^{-\frac{1}{2}} \frac{(2-x)+(1+x)}{(2-x)^2} = \frac{1}{2} \left(\frac{1+x}{2-x}\right)^{-\frac{1}{2}} \frac{3}{(2-x)^2}$

9. $y = x^2 \left(x^{\frac{1}{2}} + 2\right)$

    $y' = 2x \left(x^{\frac{1}{2}} + 2\right) + x^2 \left(\frac{1}{2} x^{-\frac{1}{2}}\right)$

10. $f(x) = 2 \left(x^2 + 1\right)^{\frac{1}{2}} + \sin\left(\frac{4\pi}{5}\right)$ tricky question! notice $\sin\left(\frac{4\pi}{5}\right)$ is just a const

    $f'(x) = \left(x^2 + 1\right)^{-\frac{1}{2}} 2x$