Differentiate each of the following functions.

1. $f(x) = \sqrt{x}\cos x$
2. $f(x) = x^3 \sin x$
3. $f(x) = \sqrt[3]{x^5}\sin x$
4. $f(x) = (3x^8 - x^6)\sin x$
5. $f(x) = \sin 2x$
6. $f(x) = \dfrac{\sin x + \cos x}{x^3}$
7. $f(x) = (3\cos x - \sin x)\sqrt{x}$
8. $f(x) = (x^3 - 5x^2 + 1)\sin x$
9. $f(x) = \dfrac{\sin x}{x} + x^3 \cos x$
10. $f(x) = (\cos x)(x^2 - 4x + 1)$

 

# Answers

1.) $f'(x) = \dfrac{1}{2\sqrt{x}}\cos x - \sqrt{x}\sin x$ 2.) $f'(x) = x^3\cos x + 3x^2\sin x$

3.) $f'(x) = (\cos x)\sqrt[3]{x^5} + \dfrac{5}{3}\sqrt[3]{x^2}(\sin x)$ 4.) $f'(x) = (\cos x)(3x^8 - x^6) + (\sin x)(24x^7 - 6x^5)$

5.) $f'(x) = 2\left(\cos^2 x - \sin^2 x\right) = 2\cos 2x$ 6.) $f'(x) = \dfrac{1}{x^3}(\cos x - \sin x) - \dfrac{3}{x^4}(\cos x + \sin x)$

7.) $f'(x) = \dfrac{1}{2\sqrt{x}}(3\cos x - \sin x) + \sqrt{x}(-\cos x - 3\sin x)$

8.) $f'(x) = \sin x(3x^2 - 10x) + \cos x(x^3 - 5x^2 + 1)$

9.) $f'(x) = \dfrac{1}{x}\cos x + 3x^2\cos x - \dfrac{1}{x^2}\sin x - x^3\sin x$

10.) $f'(x) = (\cos x)(2x - 4) - (\sin x)(x^2 - 4x + 1)$

 