

1 Higher Derivatives

For the given expressions find the indicated derivatives.

1. $s = 3t^3 - \frac{2}{t}$. Find $\frac{d^2s}{dt^2}$.
2. $f(x) = (x^2 - 5)^{12}$. Find $f''(2)$.
3. $f(x) = \ln \sin x$. Find $f''(\frac{\pi}{4})$.
4. $f(x) = \sqrt[3]{x^2 + 2}$. Find $f''(5)$.
5. $f(x) = 4 \sin^2 x - 3 \cos^2 x$. Find $f''(\pi)$.
6. $h(t) = \sin 2t$. Find $h'''(t)$.
7. $y = x^5 - x^{7/2} + 3x^3 + 2x^2 + 5x - 7$. Find $y^{(4)}$.
8. $f(x) = \ln x$. Find $f'(x), f''(x), f'''(x)$.
9. $f(x) = e^{3x}$.
 - (a) Find $f'(x), f''(x), f'''(x)$.
 - (b) Find a formula for $f^{(n)}(x)$.

Answers:

1. $\frac{d^2s}{dt^2} = 18t - \frac{4}{t^3}$
2. $f''(2) = 2088$
3. $f''(\frac{\pi}{4}) = -2$
4. $f''(5) = -\frac{38}{2187}$
5. $f''(\pi) = 14$
6. $h'''(t) = -8 \cos 2t$
7. $y^{(4)} = 120x + \frac{105}{16}x^{-1/2}$
8. $f'(x) = \frac{1}{x}, f''(x) = -\frac{1}{x^2},$
and $f'''(x) = \frac{2}{x^3}.$
9. (a) $f'(x) = 3e^{3x}, f''(x) = 9e^{3x},$
and $f'''(x) = 27e^{3x}.$
(b) $f^{(n)}(x) = 3^n e^{3x}.$