DERIVATIVES—THE POWER RULE

Note: $y = x^n$, $y' = nx^{n-1}$.

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

SOLUTIONS

1. $y = x^3 - 3x^2 + 2$
   $y' = 3x^2 - 6x$
2. $y = 3x^4 + 5x^3 - 2x^2 - 4x + 6$
   $y' = 12x^3 + 15x^2 - 4x - 4$
3. $y = x^5 - 3\sqrt{x} = x^5 - 3x^{\frac{1}{2}}$
   $y' = 5x^4 - \dfrac{3x^{-\frac{1}{2}}}{2} = 5x^4 - \dfrac{3}{2\sqrt{x}}$
4. $y = \dfrac{x^2 - 4x + 7}{x} = x - 4 + 7x^{-1}$
   $y' = 1 - 7x^{-2} = 1 - \dfrac{7}{x^2}$
5. $y = (3x+1)(5x-3) = 15x^2 - 4x - 3$
   $y' = 30x - 4$
6. $y = (x^3+1)(2x+3)$
   $= 2x^4 + 3x^3 + 2x + 3$
   $y' = 8x^3 + 9x^2 + 2$
7. $y = (x-2)(x+1)(3x+1)$
   $= 3x^3 - 2x^2 - 7x - 2$
   $y' = 9x^2 - 4x - 7$
8. $y = (x^5 + 8x)^2 = x^{10} - 4x^6 + 4x^2$
   $y' = 10x^9 - 24x^5 + 8x$
9. $y = 3x^2(x+1)(x-2)$
   $= 3x^4 - 3x^3 - 6x^2$
   $y' = 12x^3 - 9x^2 - 12x$
10. $y = \dfrac{(2x+3)(2x-3)}{x} = \dfrac{4x^2-9}{x} = 4x - 9x^{-1}$
    $y' = 4 + 9x^{-2} = 4 + \dfrac{9}{x^2}$