DIFFERENTIATION RULES - WEEK 4

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1 Examples

1. *(Example 1)* Differentiate the following powers of x:

    (a) x^3

    (b) $x^{2/3}$

    (c) $x^{\sqrt{2}}$

    (d) $\dfrac{1}{x^4}$

    (e) $x^{-4/3}$

    (f) $\sqrt{x^{2+\pi}}$

2. *(Example 2)* Compute $\dfrac{d}{dx}(3x^2)$.

3. *(Example 3)* Find the derivative of the polynomial $y = x^3 + \dfrac{4}{3}x^2 - 5x + 1$.

2 ClassWork Problems

Find the derivative of the following functions with respect to their independent variable (assume y, s, w, r depend on x, t, z, s respectively, unless otherwise implied by notation like d/dx).

4. $y = -x^2 + 3$

5. $y = x^2 + x + 8$

6. $s = 5t^3 - 3t^5$

7. $w = 3z^7 - 7z^3 + 21z^2$

8. $y = \dfrac{4x^3}{3} - x + 2e^x$

9. $y = \dfrac{x^3}{3} + \dfrac{x^2}{2} + \dfrac{x}{4}$

10. $w = 3z^{-2} - \dfrac{1}{z}$

11. $s = -2t^{-1} + \dfrac{4}{t^2}$

12. $y = 6x^2 - 10x - 5x^{-2}$

13. $y = 4 - 2x - x^{-3}$

14. $r = \dfrac{1}{3s^2} - \dfrac{5}{2s}$

15. $r = \dfrac{12}{\theta} - \dfrac{4}{\theta^3} + \dfrac{1}{\theta^4}$

16. $y = \dfrac{x^4}{2} - \dfrac{3}{2}x^2 - x$

17. $y = \dfrac{x^5}{120}$

3 Application

18. The reaction R of the body to a dose M of medicine is given by

$$R = M^2 \left(\frac{C}{2} - \frac{M}{3} \right)$$

where C is a positive constant. Find the sensitivity of the body to the medicine, which is defined as $\dfrac{dR}{dM}$.