

OPMT 5701 DERIVATIVES: PRODUCT-QUOTIENT RULES

SELECTED ANSWERS

$$1. (4x + 1)(6) + (6x + 3)(4) = 48x + 18 = 6(8x + 3)$$

$$3. (5 - 3t)(3t^2 - 4t) + (t^3 - 2t^2)(-3) \\ = -12t^3 + 33t^2 - 20t$$

$$5. (3r^2 - 4)(2r - 5) + (r^2 - 5r + 1)(6r) \\ = 12r^3 - 45r^2 - 2r + 20$$

$$7. 8x^3 - 10x$$

$$9. (x^2 + 3x - 2)(4x - 1) + (2x^2 - x - 3)(2x + 3) \\ = 8x^3 + 15x^2 - 20x - 7$$

$$11. (8w^2 + 2w - 3)(15w^2) + (5w^3 + 2)(16w + 2) \\ = 200w^4 + 40w^3 - 45w^2 + 32w + 4$$

$$13. (x^2 - 1)(9x^2 - 6) + (3x^3 - 6x + 5)(2x) - 4(8x + 2) \\ = 15x^4 - 27x^2 - 22x - 2$$

$$15. \frac{3}{2} \left[(5p^{\frac{1}{2}} - 2)(3) + (3p - 1) \left(5 \cdot \frac{1}{2} p^{-\frac{1}{2}} \right) \right] \\ = \frac{3}{4} \left(45p^{\frac{1}{2}} - 12 - 5p^{-\frac{1}{2}} \right)$$

$$17. 0 \quad 19. 18x^2 + 94x + 31$$

$$21. \frac{(x - 1)(5) - (5x)(1)}{(x - 1)^2} = -\frac{5}{(x - 1)^2}$$

$$23. -\frac{9}{x^7} \quad 25. \frac{(x - 1)(1) - (x + 2)(1)}{(x - 1)^2} = -\frac{3}{(x - 1)^2}$$

$$27. \frac{(z^2 - 4)(-2) - (6 - 2z)(2z)}{(z^2 - 4)^2} = \frac{2(z^2 - 6z + 4)}{(z^2 - 4)^2}$$

$$29. \frac{(x^2 - 5x)(16x - 2) - (8x^2 - 2x + 1)(2x - 5)}{(x^2 - 5x)^2} \\ = \frac{-38x^2 - 2x + 5}{(x^2 - 5x)^2}$$

$$31. \frac{(2x^2 - 3x + 2)(2x - 4) - (x^2 - 4x + 3)(4x - 3)}{(2x^2 - 3x + 2)^2} \\ = \frac{5x^2 - 8x + 1}{(2x^2 - 3x + 2)^2}$$

$$33. -\frac{100x^{99}}{(x^{100} + 7)^2} \quad 35. 4v^3 + \frac{8}{v^2}$$

$$37. \frac{15x^2 - 2x + 1}{3x^{4/3}} \quad 39. \frac{4}{(x - 8)^2} + \frac{2}{(3x + 1)^2}$$

$$41. \frac{[(x + 2)(x - 4)](1) - (x - 5)(2x - 2)}{[(x + 2)(x - 4)]^2} \\ = \frac{-(x^2 - 10x + 18)}{[(x + 2)(x - 4)]^2}$$

$$43. \frac{[(t^2 - 1)(t^3 + 7)](2t + 3) - (t^2 + 3t)(5t^4 - 3t^2 + 14t)}{[(t^2 - 1)(t^3 + 7)]^2} \\ = \frac{-3t^6 - 12t^5 + t^4 + 6t^3 - 21t^2 - 14t - 21}{[(t^2 - 1)(t^3 + 7)]^2}$$

$$45. 3 - \frac{2x^3 + 3x^2 - 12x + 4}{[x(x - 1)(x - 2)]^2} \quad 47. -\frac{2a}{(a + x)^2}$$

$$49. -6 \quad 51. y = -\frac{3}{2}x + \frac{15}{2} \quad 53. y = 16x + 24$$

$$55. 1.5 \quad 57. 1 \text{ m}, -1.5 \text{ m/s} \quad 59. \frac{dr}{dq} = 25 - 0.04q$$

$$61. \frac{dr}{dq} = \frac{216}{(q + 2)^2} - 3 \quad 63. \frac{dC}{dI} = 0.672$$