

Practice with Derivatives

Take the derivatives with respect to x:

- 1) 7
- 2) $3x + 2$
- 3) x^7
- 4) $5x^7$
- 5) $5x^7 + \sqrt{x} + x^{-3}$
- 6) e^x
- 7) e^{2x}
- 8) $5e^{2x} + 12$
- 9) e^{ax}
- 10) $2x^n - e^{ax}$
- 11) $(5x^7)(e^x)$
- 12) $e^{2x} x^{\frac{3}{2}}$
- 13) $(5x^2 + x^{94} + 12)(e^{2x} + 17x + 2)$
- 14) $\frac{x}{x+2}$
- 15) $\frac{x^7}{x^2+1}$
- 16) $\left(\frac{x^7}{x^2+1}\right)(e^{3x} + 24)$
- 17) $f(x) \cdot g(x)$
- 18) $\frac{f(x)}{g(x)} + 17x$
- 19) $f(x) \cdot g(x) \cdot h(x)$
- 20) e^{x^2}
- 21) $(e^x + 17x)^{32}$
- 22) $\exp(x^2 + 37x + 3)$
- 23) $f(g(x))$
- 24) $(e^{x^2} + 17x)^{32}$

- 25) $f(g(h(x)))$
- 26) $\sin(x)$
- 27) $3\sin(2x)$
- 28) $\cos(x)$
- 29) $12\cos\left(\frac{1}{2}x\right)$
- 30) 5^x (not the same as x^5 !)
- 31) $\cos(5^x + 7)$
- 32) $\sin(3 + 7e^x + \cos(5^x + 7 + e^{2x}))$
- 33) $\sin(\sin(\sin(\sin(x))))$
- 34) $\exp(\exp(\exp(\exp(x))))$
- 35)
$$\frac{\pi\sqrt{84} - \sin(17) + 9734k - \frac{284}{\pi\sqrt{3}}}{184\left(\frac{\pi}{\sqrt{3}} + 84 - \sin(12)\right) - 17x}$$

where k is a constant
- 36) $3\sin\left(\pi - 284e^{x^2} - \frac{\sqrt{2976}\cos(84)}{3\sqrt{7} - 5\sqrt{2}}\right)$
- 37) $\ln(x)$
- 38) $7 + 3\ln\left(\frac{5}{2} + 8x^2\right)$

Take partial derivatives with respect to x and y:

- 39) $7xy$
- 40) $2x + 21y$
- 41) $e^x - 7y$
- 42) $e^{2x^2y} - xy$
- 43) $\sin(\cos(\sin(\cos(xy))))$

44) $\frac{512\sqrt{\pi x^2}}{21y^{84}}$

45) $f(x) + g(y)$

46) $f(x, y) \cdot g(x, y)$

47) x^y

48) x^{2y}

49) $\frac{x - 3\sqrt{y} + 84y^2 - 7}{xy + xy^2 + x^2y + \sin(xy)}$

Take total derivatives with respect to t , if x and y are differentiable *functions of t* .

50) $x + y$

51) x^2y^2

52) $\frac{x - 3\sqrt{y} + 84y^2 - 7}{xy + xy^2 + x^2y + \sin(xy)}$

[For Ch. 5] Take total differentials:

53) $x + y$

54) x^2y^2

55) $\frac{x - 3\sqrt{y} + 84y^2 - 7}{xy + xy^2 + x^2y + \sin(xy)}$

Take the derivative of $y(x)$, and draw the graph of both $y(x)$ and $y'(x)$. Make sure you understand graphically how y and y' are related to each other.

56) $y = 7$

57) $y = x$

58) $y = x^2$

59) $y = e^x$

60) $y = e^{2x}$

61) $y = \cos(x)$

Derivatives at specific values: For (some of) exercises 1-38, compute the derivative (slope) of the expression when $x=1$. (You should be able to do the same when, say, $x=0$ or $x=10$.) Similarly, you should be able to plug in values for x and y in questions 39-49, or t in 50-52. Do a few of each type of problem.

Compute $\frac{d^2 f(x)}{dx^2}$, $\frac{d^3 f(x)}{dx^3}$, and

$\frac{d^4 f(x)}{dx^4}$, if $f(x)$ is

62) $3x + 2$

63) $5x^7 + \sqrt{x} + x^{-3}$

64) e^{ax}

65) $\cos(3x)$