

Derivatives training exercises

Maths 3c

Training exercises for derivatives.

Derive these functions.

1.

$$f(x) = x^2 + 3x$$

2.

$$g(x) = x^3 + 6x^2 + 3x$$

3.

$$h(x) = 2x^4 + 3$$

4.

$$i(x) = 6x^5 + 11$$

5.

$$j(x) = x^{64} + 16233$$

6.

$$k(x) = x^4 + 2x^3 + 6x^2 - 3x + 6$$

7.

$$l(x) = 2x^2 + \sqrt{x}$$

8.

$$m(x) = 6\sqrt[3]{x}$$

9.

$$n(x) = 4\sqrt[3]{x^2}$$

10.

$$o(x) = 2x^3 + \sqrt{x} + \sqrt[3]{x}$$

11.

$$p(x) = \sqrt[4]{x^3}$$

12.

$$q(x) = \cos x + 3x^2$$

13.

$$r(x) = x^3 - 6x^2 + \cos x$$

14.

$$s(x) = \sin x + \cos x + \frac{5}{3}x^3$$

15.

$$t(x) = \cos x + \ln x$$

16.

$$u(x) = \sqrt{x} + \ln x$$

17.

$$v(x) = 2x^2 + \ln x + \cos x + \sin x$$

18.

$$w(x) = \sin(2x^2 + 3x)$$

19.

$$x(x) = \cos(4x^5)$$

20.

$$y(x) = \ln(x^2 + 10x)$$

21.

$$z(x) = \sin(\sqrt{x})$$

22.

$$a(x) = \cos(\sqrt[3]{x})$$

23.

$$b(x) = \ln(x^2 + 2x + 6)$$

24.

$$c(x) = \cos(2x^2 + 7x + 9)$$

25.

$$d(x) = 2 \cos^2 x + 7 \cos(x + 9)$$

26.

$$e(x) = \sqrt{x^2 + 3x + 6}$$

27.

$$af(x) = x^2 \cdot \cos x$$

28.

$$ag(x) = (6x^3 + 4x) \cdot \ln x$$

29.

$$ah(x) = \cos x \cdot \sin x$$

30.

$$ai(x) = (3x^2 + 2x + 3) \cdot \sin x$$

31.

$$aj(x) = \sqrt[3]{x} \cdot \ln x$$

32.

$$ak(x) = \frac{\cos x}{\ln x}$$

33.

$$al(x) = \frac{x^2 + 4x - 4}{\cos x}$$

34.

$$am(x) = \frac{x^3 - 3x^2 + 2x}{\sqrt{x}}$$

35.

$$an(x) = \frac{\cos x}{\sin x}$$

36.

$$ao(x) = \frac{\sqrt{\cos x}}{x^2}$$

37.

$$ap(x) = \frac{\cos(\sin x)}{\sin x}$$

38.

$$aq(x) = \ln\left(\frac{\cos x}{x^3}\right)$$

39.

$$ar(x) = \cos\left(\frac{\sqrt{x}}{2x^2}\right)$$

40.

$$as(x) = \cos x \cdot x \cos x$$

41.

$$at(x) = \sqrt{x^3 \cdot \ln x}$$

Answers:

1.

$$f'(x) = 2x + 3$$

2.

$$g'(x) = 3x^2 + 12x + 3$$

3.

$$h'(x) = 8x^3$$

4.

$$i'(x) = 30x^4$$

5.

$$j'(x) = 64x^{63}$$

6.

$$k'(x) = 4x^3 + 6x^2 + 12x - 3$$

7.

$$l'(x) = 4x + \frac{1}{2}x^{-\frac{1}{2}}$$

8.

$$m'(x) = 6 \cdot \frac{1}{3}x^{-\frac{2}{3}} = \frac{2}{\sqrt[3]{x^2}}$$

9.

$$n'(x) = 4 \cdot \frac{2}{3}x^{-\frac{1}{3}}$$

10.

$$o'(x) = 6x^2 + \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{3}x^{-\frac{2}{3}}$$

11.

$$p'(x) = \frac{3}{4}x^{-\frac{1}{4}}$$

12.

$$q'(x) = -\sin x + 6x$$

13.

$$r'(x) = 3x^2 - 12x - \sin x$$

14.

$$s'(x) = \cos x - \sin x + 5x^2$$

15.

$$t'(x) = -\sin x + \frac{1}{x}$$

16.

$$u'(x) = \frac{1}{2\sqrt{x}} + \frac{1}{x}$$

17.

$$v'(x) = 4x + \frac{1}{x} - \sin x + \cos x$$

18.

$$w'(x) = \cos(2x^2 + 3x) \cdot (4x + 3)$$

19.

$$x'(x) = -\sin(4x^5) \cdot 20x^4$$

20.

$$y'(x) = \frac{1}{x^2 + 10x} \cdot (2x + 10) = \frac{2x + 10}{x^2 + 10x}$$

21.

$$z'(x) = \cos(\sqrt{x}) \cdot \frac{1}{2\sqrt{x}} = \frac{\cos(\sqrt{x})}{2\sqrt{x}}$$

22.

$$a'(x) = -\sin(\sqrt[3]{x}) \cdot \frac{1}{3\sqrt[3]{x^2}}$$

23.

$$b'(x) = \frac{1}{x^2 + 2x + 6} \cdot (2x + 2)$$

24.

$$c'(x) = -\sin(2x^2 + 7x + 9) \cdot (4x + 7)$$

25.

$$d'(x) = 4 \cos x \cdot (-\sin x) - 7 \sin(x + 9)$$

26.

$$e'(x) = \frac{1}{2\sqrt{x^2 + 3x + 6}} \cdot (2x + 3)$$

27.

$$af'(x) = 2x \cdot \cos x + x^2 \cdot (-\sin x)$$

28.

$$ag'(x) = (18x^2 + 4) \cdot \ln x + (6x^3 + 4x) \cdot \frac{1}{x}$$

29.

$$ah'(x) = -\sin x \cdot \sin x + \cos x \cdot \cos x$$

30.

$$ai'(x) = (6x + 2) \cdot \sin x + (3x^2 + 2x + 3) \cdot \cos x$$

31.

$$aj'(x) = \frac{1}{3}x^{-\frac{2}{3}} \cdot \ln x + \sqrt[3]{x} \cdot \frac{1}{x}$$

32.

$$ak'(x) = \frac{-\sin x \cdot \ln x - \cos x \cdot \frac{1}{x}}{(\ln x)^2}$$

33.

$$al'(x) = \frac{(2x + 4) \cdot \cos x + (x^2 + 4x - 4) \cdot \sin x}{\cos^2 x}$$

34.

$$am'(x) = \frac{(3x^2 - 6x + 2) \cdot \sqrt{x} - (x^3 - 3x^2 + 2x) \cdot \frac{1}{2\sqrt{x}}}{x}$$

35.

$$an'(x) = \frac{-\sin^2 x - \cos^2 x}{\sin^2 x}$$

36.

$$ao'(x) = \frac{\frac{-1}{2\sqrt{\cos x}} \cdot \sin x \cdot x^2 - \sqrt{\cos x} \cdot 2x}{x^4}$$

37.

$$ap'(x) = \frac{-\sin(\sin x) \cdot \cos x \cdot \sin x - \cos(\sin x) \cdot \cos x}{\sin^2 x}$$

38.

$$aq'(x) = \frac{x^3}{\cos x} \cdot \left(\frac{-\sin x \cdot x^3 - \cos x \cdot 2x^2}{x^6} \right)$$

39.

$$ar'(x) = -\sin\left(\frac{1}{2}x^{\frac{-3}{2}}\right) \cdot \left(\frac{-3}{4}x^{\frac{-5}{2}}\right)$$

40.

$$as'(x) = 2 \cos x \cdot (-\sin x) + \cos^2 x$$

41.

$$at'(x) = \frac{x^2(3 \ln x + 1)}{2\sqrt{x^3 \cdot \ln x}}$$