CALCULUS 2

WORKED EXAMLES

DERIVATIVES OF EXPONENTIAL FUNCTIONS

DERIVATIVES OF EXPONENTIAL FUNCTIONS

Note: 1. $\frac{d}{dx}\left(e^x\right)=e^x$. **2.** $\frac{d}{dx}\left(a^x\right)=\left(\ln a\right)a^x$

Find the derivatives of the following exponential functions.

1) $f\left(x\right)=2e^x+x^2$

2) $y=5t^2+4e^t$

3) $y=5^x+2$

4) $f\left(x\right)=2^x+2*3^x$

5) $y=5x^2+2^x+3$

6) $f\left(x\right)=12e^x+11^x$

7) $y=4*10^x-x^3$

8) $y=3x-2*4^x$

9) $y=\frac{3^x}{3}+\frac{33}{\sqrt{x}}$

10) $f\left(x\right)=e^2+x^e$

11) $f\left(x\right)=e^{1+x}$

12) $f\left(t\right)=e^{t+2}$

13) $f\left(t\right)=e^{\theta-1}$

14) $z=\left(\ln 4\right)e^x$

15) $z=\left(\ln 4\right)4^x$

16) $f\left(t\right)=\left(\ln 3\right)^t$

17) $f\left(x\right)=x^3+3^x$

18) $y=5.5^t+6.6^t$

19) $y=\pi^2+\pi^x$

20) $h\left(z\right)=\left(\ln 2\right)^z$

21) $f\left(x\right)=e^\pi+\pi^x$

22) $f\left(x\right)=\pi^x+x^\pi$

23) $y=a^x+x^a$

24) $f\left(x\right)=x^{\pi^2}+\left(\pi^2\right)^x$

25) $f\left(z\right)=\left(\ln 3\right)z^2+\left(\ln 4\right)e^z$

26) $g\left(x\right)=2x-\frac{1}{\sqrt[3]{x}}+3^x-e$

27) $g\left(x\right)=x^k+k^x$

28) $r\left(\theta\right)=e^{\left(e^\theta+e^{-\theta}\right)}$

29) $g\left(x\right)=e^{3x^2}\left(3x^5-4\right)$

30) $f\left(x\right)=\frac{x^4+3}{e^{5x^5}}$

SOLUTIONS

1) $f(x)=2e^x+x^2$

$f'(x)=2e^x+2x$

2) $y=5t^2+4e^t$

$y'=10t+4e^t$

3) $y=5^x+2$

$y'=(\ln 5)5^x$

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

$f'(x)=(\ln 2)2^x+2(\ln 3)3^x$

5) $y=5x^2+2^x+3$

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

6) $f(x)=12e^x+11^x$

$f'(x)=12e^x+(\ln 11)11^x$

7) $y=4*10^x-x^3$

$y'=4(\ln 10)10^x-3x^2$

8) $y=3x-2*4^x$

$y'=3-2(\ln 4)4^x$

9) $y=\dfrac{3^x}{3}+\dfrac{33}{\sqrt{x}}$

$y=\dfrac{1}{3}*3^x+33*x^{-\frac{1}{2}}$

$y'=\dfrac{1}{3}(\ln 3)3^x-\dfrac{1}{2}x^{-\frac{3}{2}}(33)$

10) $f(x)=e^2+x^e$

$f'(x)=ex^{e-1}$

11) $f(x)=e^{1+x}$

$f(x)=e^1*e^x$

$f'(x)=e^{1+x}$

12) $f(t)=e^{t+2}$

$f(t)=e^t*e^2$

$f'(t)=e^{t+2}$

13) $f(t)=e^{\theta-1}$

$y=e^{\theta}*e^{-1}$

$y'=e^{\theta-1}$

14) $z=(\ln 4)e^x$

$z'=(\ln 4)e^x$

15) $z=(\ln 4)4^x$

$z'=(\ln 4)(\ln 4)4^x$

$z'=(\ln 4)^2\,4^x$

16) $f(t)=(\ln 3)^t$

$f'(t)=(\ln 3)^t\ln(\ln 3)$

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

$f'(x)=3x^2+(\ln 3)3^x$

18) $y=5.5^t+6.6^t$

$y'=5.5^t(\ln 5.5)+6.6^t(\ln 6.6)$

19) $y=\pi^2+\pi^x$

$y'=\pi^x\ln\pi$

20) $h(z)=(\ln 2)^z$

$h'(z)=(\ln 2)^z\ln(\ln 2)$

21) $f(x) = e^{\pi} + \pi^{x}$

$f'(x) = \pi^{x} \ln \pi$

22) $f(x) = \pi^{x} + x^{\pi}$

$f'(x) = \pi^{x} \ln \pi + \pi x^{\pi - 1}$

23) $y = a^{x} + x^{a}$

$y' = a^{x} \ln a + a x^{a-1}$

24) $f(x) = x^{\pi^{2}} + \left(\pi^{2}\right)^{x}$

$f'(x) = \pi^{2} x^{\pi^{2}-1} + \left(\pi^{2}\right)^{x} \ln\left(\pi^{2}\right)$

25) $f(z) = (\ln 3) z^{2} + (\ln 4) e^{z}$

$f'(z) = (2\ln 3) z + (\ln 4) e^{z}$

26) $g(x) = 2x - \dfrac{1}{\sqrt[3]{x}} + 3^{x} - e$

$g'(x) = 2 + \dfrac{x^{-\frac{4}{3}}}{3} + 3^{x} \ln 3$

27) $g(x) = x^{k} + k^{x}$

$g'(x) = k x^{k-1} + k^{x} \ln k$

28) $r(\theta) = e^{\left(e^{\theta} + e^{-\theta}\right)}$

$r'(\theta) = \left(e^{\theta} - e^{-\theta}\right)\left(e^{\left(e^{\theta} + e^{-\theta}\right)}\right)$

29) $g(x) = e^{3x^{2}}\left(3x^{5} - 4\right)$

$g'(x) = 6x e^{3x^{2}}\left(3x^{5} - 4\right) + e^{3x^{2}} * 15x^{4}$

$= 3x e^{3x^{2}}\left(2\left(3x^{5} - 4\right) + 5x^{3}\right)$

$= 3x e^{3x^{2}}\left(6x^{5} + 5x^{3} - 8\right)$

30) $f(x) = \dfrac{x^{4} + 3}{e^{5x^{5}}}$

$$f'(x) = \frac{e^{5x^{5}} * 4x^{3} - \left(x^{4} + 3\right) * 25x^{4} e^{5x^{5}}}{\left(e^{5x^{5}}\right)^{2}}$$

$$= \frac{x^{3} e^{5x^{5}}\left\{4 - 25x\left(x^{4} + 3\right)\right\}}{\left(e^{5x}\right)^{2}}$$

$$= \frac{x^{3}\left(4 - 25x^{5} - 75x\right)}{e^{5x^{5}}}$$