1. Differentiate: $f(x) = -5(10^x) + 3\log x - 5(10^x)$

2. Differentiate: $f(x) = -5(5^x) - 4\sin x + 5\sin x$

3. Differentiate: $f(x) = -4(3^x) - (5^x) - \log x$

4. Differentiate: $f(x) = -5e^x + 3(2^x) + 5e^x$

5. Differentiate: $f(x) = 4e^x + 3(3^x) + 4\ln x$

6. Differentiate: $f(x) = 4\log x + 4\cos x - 4\cos x$

7. Differentiate: $f(x) = -\log_3 x + \ln x + 3\sin x$

8. Differentiate: $f(x) = 4\sin x + 2\log x - 5\ln x$

9. Differentiate: $f(x) = -3\sin x - 5\log_5 x - \cos x$

10. Differentiate: $f(x) = 3\ln x + 5\cos x - (10^x)$

Answers:

1. $f(x) = -5(\ln 10)10^x + \dfrac{3}{(\ln 10)x} - 5(\ln 10)10^x$

2. $f(x) = -5(\ln 5)5^x - 4\cos x + 5\cos x$

3. $f(x) = -4(\ln 3)3^x - (\ln 5)5^x + \dfrac{-1}{(\ln 10)x}$

4. $f(x) = -5e^x + 3(\ln 2)2^x + 5e^x$

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

6. $f(x) = \dfrac{4}{(\ln 10)x} - 4\sin x + 4\sin x$

7. $f(x) = \dfrac{-1}{(\ln 3)x} + \dfrac{1}{x} + 3\cos x$

8. $f(x) = 4\cos x + \dfrac{2}{(\ln 10)x} + \dfrac{-5}{x}$

9. $f(x) = -3\cos x + \dfrac{-5}{(\ln 5)x} + \sin x$

10. $f(x) = \dfrac{3}{x} - 5\sin x - (\ln 10)10^x$

Solutions:

1. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x} f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5(10^x) + 3\log x - 5(10^x)]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x} f(x) + \frac{\mathrm{d}}{\mathrm{d}x} g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5(10^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[3\log x] + \frac{\mathrm{d}}{\mathrm{d}x}[-5(10^x)]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= -5\frac{\mathrm{d}}{\mathrm{d}x}(10^x) + 3\frac{\mathrm{d}}{\mathrm{d}x}\log x + -5\frac{\mathrm{d}}{\mathrm{d}x}(10^x)$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} 10^x = (\ln 10)10^x$ $\frac{\mathrm{d}}{\mathrm{d}x}\log x = \frac{1}{(\ln 10)x}$ $\frac{\mathrm{d}}{\mathrm{d}x} 10^x = (\ln 10)10^x$

$= -5(\ln 10)10^x + 3\frac{1}{(\ln 10)x} + -5(\ln 10)10^x$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-5(10^x) + 3\log x - 5(10^x)] = -5(\ln 10)10^x + \frac{3}{(\ln 10)x} - 5(\ln 10)10^x$

2. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x} f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5(5^x) - 4\sin x + 5\sin x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x} f(x) + \frac{\mathrm{d}}{\mathrm{d}x} g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5(5^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[-4\sin x] + \frac{\mathrm{d}}{\mathrm{d}x}[5\sin x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= -5\frac{\mathrm{d}}{\mathrm{d}x}(5^x) + -4\frac{\mathrm{d}}{\mathrm{d}x}\sin x + 5\frac{\mathrm{d}}{\mathrm{d}x}\sin x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} b^x = (\ln b)b^x$ $\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x$ $\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x$

$= -5(\ln 5)5^x + -4\cos x + 5\cos x$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-5(5^x) - 4\sin x + 5\sin x] = -5(\ln 5)5^x - 4\cos x + 5\cos x$

3. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x} f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-4(3^x) - (5^x) - \log x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x} f(x) + \frac{\mathrm{d}}{\mathrm{d}x} g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-4(3^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[-(5^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[-\log x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= -4\frac{\mathrm{d}}{\mathrm{d}x}(3^x) + -\frac{\mathrm{d}}{\mathrm{d}x}(5^x) + -\frac{\mathrm{d}}{\mathrm{d}x}\log x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} b^x = (\ln b)b^x$ $\frac{\mathrm{d}}{\mathrm{d}x} b^x = (\ln b)b^x$ $\frac{\mathrm{d}}{\mathrm{d}x}\log x = \frac{1}{(\ln 10)x}$

$= -4(\ln 3)3^x + -(\ln 5)5^x + -\frac{1}{(\ln 10)x}$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-4(3^x) - (5^x) - \log x] = -4(\ln 3)3^x - (\ln 5)5^x + \frac{-1}{(\ln 10)x}$

4. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x} f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5e^x + 3(2^x) + 5e^x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x} f(x) + \frac{\mathrm{d}}{\mathrm{d}x} g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-5e^x] + \frac{\mathrm{d}}{\mathrm{d}x}[3(2^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[5e^x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= -5\frac{\mathrm{d}}{\mathrm{d}x}e^x + 3\frac{\mathrm{d}}{\mathrm{d}x}(2^x) + 5\frac{\mathrm{d}}{\mathrm{d}x}e^x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}e^x = e^x$ $\frac{\mathrm{d}}{\mathrm{d}x}b^x = (\ln b)b^x$ $\frac{\mathrm{d}}{\mathrm{d}x}e^x = e^x$

$= -5e^x + 3(\ln 2)2^x + 5e^x$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-5e^x + 3(2^x) + 5e^x] = -5e^x + 3(\ln 2)2^x + 5e^x$

5. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4e^x + 3(3^x) + 4\ln x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4e^x] + \frac{\mathrm{d}}{\mathrm{d}x}[3(3^x)] + \frac{\mathrm{d}}{\mathrm{d}x}[4\ln x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= 4\frac{\mathrm{d}}{\mathrm{d}x}e^x + 3\frac{\mathrm{d}}{\mathrm{d}x}(3^x) + 4\frac{\mathrm{d}}{\mathrm{d}x}\ln x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}e^x = e^x$ $\frac{\mathrm{d}}{\mathrm{d}x}b^x = (\ln b)b^x$ $\frac{\mathrm{d}}{\mathrm{d}x}\ln x = \frac{1}{x}$

$= 4e^x + 3(\ln 3)3^x + 4\frac{1}{x}$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[4e^x + 3(3^x) + 4\ln x] = 4e^x + 3(\ln 3)3^x + \frac{4}{x}$

6. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4\log x + 4\cos x - 4\cos x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4\log x] + \frac{\mathrm{d}}{\mathrm{d}x}[4\cos x] + \frac{\mathrm{d}}{\mathrm{d}x}[-4\cos x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= 4\frac{\mathrm{d}}{\mathrm{d}x}\log x + 4\frac{\mathrm{d}}{\mathrm{d}x}\cos x + -4\frac{\mathrm{d}}{\mathrm{d}x}\cos x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}\log x = \frac{1}{(\ln 10)x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x$ $\frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x$

$= 4\frac{1}{(\ln 10)x} + 4(-\sin x) + -4(-\sin x)$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[4\log x + 4\cos x - 4\cos x] = \frac{4}{(\ln 10)x} - 4\sin x + 4\sin x$

7. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-\log_3 x + \ln x + 3\sin x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-\log_3 x] + \frac{\mathrm{d}}{\mathrm{d}x}[\ln x] + \frac{\mathrm{d}}{\mathrm{d}x}[3\sin x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= -\frac{\mathrm{d}}{\mathrm{d}x}\log_3 x + \frac{\mathrm{d}}{\mathrm{d}x}\ln x + 3\frac{\mathrm{d}}{\mathrm{d}x}\sin x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}\log_b x = \frac{1}{(\ln b)x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\ln x = \frac{1}{x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x$

$= -\frac{1}{(\ln 3)x} + \frac{1}{x} + 3\cos x$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-\log_3 x + \ln x + 3\sin x] = \frac{-1}{(\ln 3)x} + \frac{1}{x} + 3\cos x$

8. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4\sin x + 2\log x - 5\ln x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[4\sin x] + \frac{\mathrm{d}}{\mathrm{d}x}[2\log x] + \frac{\mathrm{d}}{\mathrm{d}x}[-5\ln x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= 4\frac{\mathrm{d}}{\mathrm{d}x}\sin x + 2\frac{\mathrm{d}}{\mathrm{d}x}\log x + -5\frac{\mathrm{d}}{\mathrm{d}x}\ln x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x$ $\frac{\mathrm{d}}{\mathrm{d}x}\log x = \frac{1}{(\ln 10)x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\ln x = \frac{1}{x}$

$= 4\cos x + 2\frac{1}{(\ln 10)x} + -5\frac{1}{x}$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[4\sin x + 2\log x - 5\ln x] = 4\cos x + \frac{2}{(\ln 10)x} + \frac{-5}{x}$

9. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-3\sin x - 5\log_5 x - \cos x]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[-3\sin x] + \frac{\mathrm{d}}{\mathrm{d}x}[-5\log_5 x] + \frac{\mathrm{d}}{\mathrm{d}x}[-\cos x]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= -3\frac{\mathrm{d}}{\mathrm{d}x}\sin x + -5\frac{\mathrm{d}}{\mathrm{d}x}\log_5 x + -\frac{\mathrm{d}}{\mathrm{d}x}\cos x$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x$ $\frac{\mathrm{d}}{\mathrm{d}x}\log_b x = \frac{1}{(\ln b)x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x$

$= -3\cos x + -5\frac{1}{(\ln 5)x} + -(-\sin x)$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[-3\sin x - 5\log_5 x - \cos x] = -3\cos x + \frac{-5}{(\ln 5)x} + \sin x$

10. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) = \frac{\mathrm{d}}{\mathrm{d}x}[3\ln x + 5\cos x - (10^x)]$

Apply: $\frac{\mathrm{d}}{\mathrm{d}x}[f(x) + g(x) + ...] = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) + ...$

$f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}[3\ln x] + \frac{\mathrm{d}}{\mathrm{d}x}[5\cos x] + \frac{\mathrm{d}}{\mathrm{d}x}[-(10^x)]$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}cf(x) = c\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$= 3\frac{\mathrm{d}}{\mathrm{d}x}\ln x + 5\frac{\mathrm{d}}{\mathrm{d}x}\cos x + -\frac{\mathrm{d}}{\mathrm{d}x}(10^x)$ ◀ Apply: $\frac{\mathrm{d}}{\mathrm{d}x}\ln x = \frac{1}{x}$ $\frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x$ $\frac{\mathrm{d}}{\mathrm{d}x}10^x = (\ln 10)10^x$

$= 3\frac{1}{x} + 5(-\sin x) + -(\ln 10)10^x$ ◀ Simplify:

$\therefore \frac{\mathrm{d}}{\mathrm{d}x}[3\ln x + 5\cos x - (10^x)] = \frac{3}{x} - 5\sin x - (\ln 10)10^x$

