

Write your questions
and thoughts here!**Derivatives of $\cos x$ and $\sin x$**

$$\frac{d}{dx} \cos x =$$

$$\frac{d}{dx} \sin x =$$

Example: Find $f'(x)$ if $f(x) = 2 \sin x - 5 \cos x$ **Recall:**

$\ln 1 =$

$\ln 0 =$

$e^0 =$

$e^{\ln a} =$

$\ln e^a =$

Derivatives of Exponential Functions

$$\frac{d}{dx} a^x =$$

$$\frac{d}{dx} e^x =$$

Example: Find $f'(x)$ if $f(x) = 2^x + 3e^x$ **Derivatives of Logarithmic Functions**

$$\frac{d}{dx} \log_a x =$$

$$\frac{d}{dx} \ln x = \frac{d}{dx} \log_e x =$$

Example: Find $f'(x)$ if $f(x) = \log_4 x - 4 \ln x$ **Find the derivative of each function.**

1. $f(x) = 2 \sin x + 5e^x$

2. $f(x) = 3^x - 4 \cos x$

3. $f(x) = \log_2 x - \sin x$

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Find the value of the derivative at the given point.

4. If $f(x) = 3 \ln x + e^x$, find $f'(5)$

5. If $f(x) = 3 \cos x + \frac{\sin x}{2}$, find $f'(\pi)$

2.7 Derivatives of $\cos x$, $\sin x$, e^x , and $\ln x$

Practice

Calculus

Find the derivative of each function.

1. $f(x) = 2 \ln x$

2. $f(x) = 5^x$

3. $f(x) = 9 \cos x$

4. $f(x) = 5e^x$

5. $f(x) = 8 \ln x - 4 \cos x + e$

6. $f(x) = 15 \sin x - 3e^x$

7. $f(x) = \log_2 x$

8. $f(x) = \log_7 x + \cos x$

9. $f(x) = 3^x + 3x + x^3$

10. $f(x) = 3 \sin x$

Find the value of the derivative at the given point.

11. If $f(x) = 3x - 6 \cos x$, find $f'\left(\frac{\pi}{2}\right)$

12. If $f(x) = \sqrt{x} - 2 \ln x$, find $f'(4)$

13. If $f(x) = 4e^x + 5 \sin x$, find $f'(0)$

14. If $f(x) = 2 \cos x + e^x$, find $f'(\pi)$

Find the equation of the tangent line at the given x -value.

15. $f(x) = 3 \cos x + x$ at $x = \frac{\pi}{2}$

16. $f(x) = 4e^x - 3 \sin x + x^2$ at $x = 0$

2.7 Derivatives of $\cos x$, $\sin x$, e^x , and $\ln x$

Test Prep

17. What is the slope of the line tangent to the graph of $y = 2 \ln(x)$ at the point $x = 8$?

- (A) $\frac{1}{16}$ (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 16 (E) 4

18. If $x = 3$, $\lim_{h \rightarrow 0} \frac{\ln(x+h) - \ln(x)}{h} =$

- (A) $\ln 3$ (B) 1 (C) $\frac{1}{3}$ (D) nonexistent

19. $\lim_{h \rightarrow 0} \frac{\cos(\frac{\pi}{6}+h) - \cos(\frac{\pi}{6})}{h} =$

- (A) 0 (B) -1 (C) $-\frac{\sqrt{3}}{2}$ (D) $-\frac{1}{2}$ (E) nonexistent

20. If $f(x) = \sin x$, then $\lim_{x \rightarrow \pi} \frac{f(\pi) - f(x)}{x - \pi} =$

- (A) $-\pi$ (B) -1 (C) 1 (D) π

21. **Calculator active.** Line L is tangent to the graph of $y = 2 \sin x$ at the point $(k, 2 \sin k)$, where $0 < k < 2\pi$. For what value of k does the line L pass through the origin?

- (A) 1.571 (B) 4.493 (C) 4.712 (D) 3.141 (E) There is no such value of k .
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22. $f(x) = x + a \cos x$, where a is a positive constant and $0 \leq x \leq 2\pi$. Find the x -coordinates of all points, $0 \leq x \leq 2\pi$, where the line $y = x + a$ is tangent to the graph of $f(x)$.