AP Calculus AB - Worksheet 36 **Derivatives of Exponential and Logarithmic Functions**

Know the following theorems:

$\frac{d}{dx}\left(e^{\square}\right)=e^{\square}\cdot d\square$	$\frac{d}{dx}\left(b^{\square}\right)=b^{\square}\cdot d\square\cdot\ln b$	$\frac{d}{dx}\left(\ln\square\right)=\frac{d\square}{\square}$	$\frac{d}{dx}\left(\log_b\square\right)=\frac{d\square}{\square\cdot\ln b}$

Examples

1.

$$\frac{d}{dx}\left[\ln(2x)\right]$$

$$\frac{d}{dx}\left[\ln\boxed{2x}\right]=\frac{1}{\boxed{2x}}\cdot 2$$

$$=\frac{1}{x}$$

2.

$$\frac{d}{dx}\left[e^{\sin x}\right]$$

$$\frac{d}{dx}\left[e^{\boxed{\sin x}}\right]=e^{\boxed{\sin x}}\cdot\cos x$$

3.

$$\frac{d}{dx}\left[\log_2(\sin x)\right]$$

$$\frac{d}{dx}\left[\log_2\boxed{\sin x}\right]=\frac{d\boxed{\sin x}}{(\ln 2)\cdot(\sin x)}$$

$$=\frac{\cos x}{(\ln 2)(\sin x)}=\frac{\cot x}{\ln 2}$$

Find $\frac{dy}{dx}$**.**

1. $y=2e^x$

2. $y=e^{2x}$

3. $y=\log_3(\sin x)$

4. $y=e^{-5x}$

5. $y=e^{2x/3}$

6. $y=\ln\left(x^3\right)$

7. $y=xe^x$

8. $y=x^2e^x-xe^x$

9. $y=4^{\sqrt{x}}$

10. $y=5^{\left(x^2\right)}$

11. $y=\ln(\cos x)$

12. $y=(\ln x)^2$

13. $y=(\ln x+\sin x)^4$

14. $y=\ln\left(\frac{10}{x}\right)$

15. $y=\log_4\left(x^2-3x+\cos x\right)$

16. $y=x\ln x-x$

17. Find y'' for $y=x^2e^x$.

18. Find an equation of the tangent line to the graph of the given function at the indicated x-value.

a) $f(x)=3x^2-\ln x,\quad x=1$

b) $f(x)=\ln(1+\sin x),\quad x=\frac{\pi}{4}$