

## Logarithms

Find the logarithms. Do not use a calculator. If they do not exist, state so.

1.  $\log_3 \left( \frac{1}{27} \right)$

16.  $\log_{0.07} \left( \frac{1}{0.07^4} \right)$

30.  $\ln \sqrt{e^{3x}}$

2.  $\log_{\frac{1}{3}} 9$

17.  $\ln \frac{1}{\sqrt{e}}$

31.  $\ln \sqrt[3]{e^2}$

3.  $\log_3 \sqrt{3}$

18.  $\ln e^3$

32.  $\log_{81} 3$

4.  $\ln \frac{1}{e^{0.247}}$

19.  $\log 10,000,000,000^2$

33.  $\log \left( \frac{1}{10^x} \right)$

5.  $\ln \sqrt[3]{\frac{1}{e^2}}$

20.  $\log_{\sqrt{8}} \sqrt{8}$

6.  $\log \sqrt{1000}$

21.  $\log_{\frac{1}{4}} 4$

34.  $\log_{\pi} \left( \frac{1}{\pi^4} \right)$

7.  $\log_{\sqrt{5}} 25$

22.  $\log_4 16$

35.  $\ln e^{3x}$

8.  $\log_2 \left( \frac{1}{2} \right)$

23.  $\log_3 9$

36.  $\log_{0.01} (1000)$

9.

24.  $\log_2 32$

37.  $\ln e^{3\sqrt{2\pi}}$

$\log_5 \left( \frac{1}{125} \right)$

25.  $\log_2 \left( \frac{1}{32} \right)$

38.  $\log 10^{\sqrt{17}}$

10.  $\log_{\pi} 0$

26.  $\log_7 \sqrt{7}$

39.  $\ln(1/e^{123456789})$

11.  $\log_{\pi} 1$

27.  $\ln e^{1234567}$

40.  $\log \left( \frac{1}{10^{4x}} \right)$

12.  $\log \left( \frac{1}{\sqrt[3]{10}} \right)$

28.  $\log_{19} \left( \frac{1}{19} \right)$

13.  $\log_{27} 9$

29.  $\log \sqrt{10^x}$

14.  $\log_7 49$