## Exercise 296

For the following exercises, use the change-of-base formula and either base 10 or base $e$ to evaluate the given expressions. Answer in exact form and in approximate form, rounding to four decimal places.

$$\log_2 \pi$$

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**Solution**

In order to evaluate this expression, set it equal to an unknown variable $x$.

$$\log_2 \pi = x$$

The base is 2, the exponent is $x$, and the result is $\pi$.

$$2^x = \pi$$

To solve for $x$, take the logarithm of both sides (ln or log—it doesn't matter).

$$\ln 2^x = \ln \pi$$

Use the property of logarithms that brings the exponent down in front.

$$x \ln 2 = \ln \pi$$

Divide both sides by $\ln 2$ to solve for $x$.

$$x = \frac{\ln \pi}{\ln 2} \approx 1.6515$$