Exercise 56

Solve each inequality for x.

(a) $1 < e^{3x-1} < 2$ (b) $1 - 2\ln x < 3$

Solution

Part (a)

$$1 < e^{3x-1} < 2$$

Take the natural logarithm of all sides.

$$\ln 1 < \ln e^{3x-1} < \ln 2$$

Bring the exponent down in front.

$$\ln 1 < (3x-1)\ln e < \ln 2$$

$$0 < 3x - 1 < \ln 2$$

Add 1 to all sides.

$$1 < 3x < 1 + \ln 2$$

Divide all sides by 3.

$$\frac{1}{3} < x < \frac{1}{3}(1 + \ln 2)$$

Part (b)

$$1 - 2\ln x < 3$$

Subtract 1 from both sides.

$$-2\ln x < 2$$

Divide both sides by -2.

$$\ln x > -1$$

Exponentiate both sides.

$$e^{\ln x} > e^{-1}$$

$$x > e^{-1}$$