$$\frac{8^x - 2^x}{6^x - 3^x} = 2$$

Multiply by the preceding denominator:

$$f(x) = 8^x - 2^x - 2(6^x - 3^x)$$

$$f'(x) = 8^x \ln 8 - 2^x \ln 2 - 2[6^x \ln 6 - 3^x \ln 3]$$

By inspection and the Newton-Raphson iteration method using the function and its derivative, it is easy to show that x = 1.

x0 = 2.0
maximum iterations = 100
x1 = 1
iterations = 10
x0 = 1.75
maximum iterations = 100
x1 = 1
iterations = 100
x0 = 1.5
maximum iterations = 100
x1 = 1
iterations = 9
x0 = 1.25
maximum iterations = 100
x1 = 1
iterations = 8
x0 = 1
maximum iterations = 100
x1 = 1
iterations = 1
x0 = 0