

1. Find the derivative of each function.

(a)  $f(x) = \ln(x) - x^2 + 3e^x + \ln(2)$

(b)  $f(x) = e^x \sin(x^2)$

(c)  $f(x) = \ln(x)(x^3 - 3)$

(d)  $f(x) = -\ln(\cos(x))$

2. Let  $f(x) = \ln(x) - \frac{x^2}{20}$ .

Find the value of  $x$  where  $f(x)$  reaches its maximum.