

# MATH 100, Tutorial 7

## (Week of March 4, 2024)

**Exercise 1** Determine the domain, range, and horizontal asymptote(s) of the following functions:

(a)  $f(x) = e^x + 2$ .

(b)  $f(x) = e^{-2x} - 1$ .

(c)  $f(x) = 1 - 2^x$ . In this part, write  $f$  in terms of the natural exponential (terms of the form  $e^{u(x)}$  not  $2^x$ ).

(d)  $f(x) = 7^{x+1} + 2$ . In this part, write  $f$  in terms of the natural exponential (terms of the form  $e^{u(x)}$  not  $7^x$ ).

(e)  $f(x) = \ln(x + 1)$

(f)  $f(x) = \ln(x^2 + 1)$

(g)  $f(x) = \ln(x^2 - 2x - 3)$

**Exercise 2** Solve the following equations if possible.

(a)  $\ln(x + 1) + \ln(x + 2) = \ln 4$ .

(b)  $4^{x+1} - 32 = 0$ .

(c)  $2^{5x} - 20(2^x) = 0$ .

(d)  $7^{3x-2} - 11 = 0$ .

(e)  $\log_6(x + 9) + \log_6 x = 2$ .

(f)  $\log_5(3x + 2) = -2$ .

**Exercise 3** Find  $\frac{dy}{dx}$  in what follows:

(a)  $\frac{x^2}{25} - \frac{y^2}{16} = 49$ .

(b)  $x^2y = 2y - 9$ .

(c)  $xy - \cos(xy) = 1$ .

(d)  $y\sqrt{x+4} = xy + 8$ .

**Exercise 4** For the  $x^2 + xy + y^2 = 7$ ,

(a) find the  $x$ -intercept(s).

(b) find the slope of the tangent line(s) at the  $x$ -intercepts.

**Exercise 5** Find the equation of the tangent line to the graph of the equations at the specified point:

(a)  $x^2 + 2xy - 3y^2 = 0$  at the point  $(1, 1)$ .

(b)  $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{6}$  at the point  $\left(0, \frac{1}{2}\right)$ .

(c)  $\tan^{-1}(x + y) = x^2 + \frac{\pi}{4}$  at the point  $(0, 1)$ .