

# MATH 22 Section 010

## Problem Set

HsuanCheng WU

---

**Disclaimer:** These questions are just for a brief review purpose.

### Problems

**Problem 1** Find all the real solutions of

$$x^3 - 3x^2 + x = 3$$

**Problem 2** Let  $f(x) = 2x^3 - 2x^2 - 34x - 30$ , given that one of the zeros is 5.

- (a) Find the complete factored form of  $f$ .
- (b) List all the zeros of  $f$ .

**Problem 3** Find any vertical or horizontal asymptotes of

(a)

$$f(x) = \frac{1 - x^2}{x^2 - 4}$$

(b)

$$f(x) = \frac{1 - x^2}{x - 4}$$

(c)

$$f(x) = \frac{1 - x^2}{x^4 + 4}$$

**Problem 4** Let  $f(x) = \frac{4}{x^2+6}$ .

- (a) Find any vertical or horizontal asymptotes of  $f$ .
- (b) Find  $f(0)$  and  $f(5)$ .
- (c) Is  $f$  increasing or decreasing?
- (d) Plot  $f$  and include all of the details in (a) and (b).

**Problem 5** Solve the rational inequality

$$\frac{(x+1)(x-2)}{x+3} \geq 0$$

**Problem 6** Let  $f(x) = \frac{2x+1}{5x-3}$  and  $g(x) = x^2 + 3x + 1$ .

- (a) Find  $(f \circ g)(x)$ . No need to expand.
- (b) Find  $(g \circ f)(x)$ . No need to expand.
- (c) Find the value of  $(g \circ f)(2)$ .
- (d) Find  $f^{-1}(x)$ .
- (e) Calculate  $f^{-1}(2)$ .

**Problem 7** Find  $f^{-1}(x)$ , where

$$f(x) = \frac{2x}{x+6}$$

**Problem 8** Let's review the basics of exponential and logarithmic functions. Let  $f(x) = e^x$  and  $g(x) = \ln x$ .

- (a) Find  $Dom(f)$ ,  $Range(f)$ ,  $Dom(g)$  and  $Range(g)$ .
- (b) Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .
- (c) State whether  $f$  is increasing or decreasing.
- (d) State whether  $g$  is increasing or decreasing.
- (e) Is  $f$  a one-to-one function?
- (f) Find the horizontal asymptote of  $f$ .
- (g) Find is the vertical asymptote of  $g$ .

**Problem 9** Expand the expression

$$\log_3 \sqrt{\frac{x^3 + 9}{(x - 5)^{10}}}$$

**Problem 10** Combine the expression

$$3 + \ln e^3 + \ln(x + 5) - \ln(x - 10)^3$$

**Problem 11** Solve the equations

(a)

$$4^{t+10} = 7^{2t+1}$$

(b)

$$3e^x + 2 = 8$$

(c)

$$\log x - 3 = \ln e^{-1}$$

**Problem 12** Solve the equations

(a)

$$\ln(x^2 - 9) - \ln(x - 3) = \ln(2x - 1)$$

(b)

$$e^{2x} - 10e^x + 21 = 0$$

(c)

$$\log_3 x + 3 \log_3 x^2 = 14$$

(d)

$$\ln x^4 - \ln x^2 = 4$$