**Q 1.** *Let $f(x) = \ln x$ and $g(x) = 4 - x^2$ be functions defined in their natural domains. Write formulas for $f \circ g$, $f \circ f$ and find the domain of each.*

**Q 2.** *Start with the graph of $y = \ln x$. Find an equation of the graph and draw that results from*
*a) shifting down 4, right 2 units*
*b) vertical stretching by a factor of 4*
*c) reflecting about line $y = x$*
*d) horizantal and vertical compression by a factor of 2.*

**Q 3.** *The accompanying figure shows the graph of a function $f(x)$ with domain $[-3, 3]$ and range $[0, 2]$. Find the domains and ranges of the following functions, and sketch their graphs.*
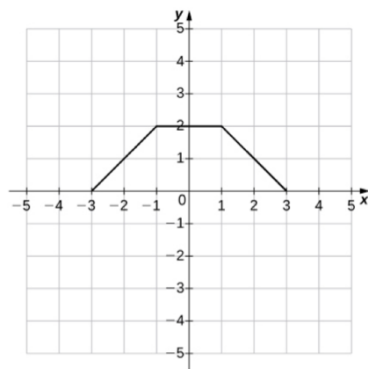


   *a) $f(x) - 2$*          *b) $f(x - 2)$*          *c) $f(-3x + 2)$*          *d) $2 - 2f(3x + 2)$.*

**Q 4.** *Draw the graph of $y = 2\sin(3x + \frac{3\pi}{4})$ by describing the each steps of transformations. Then find the amplitude and period.*

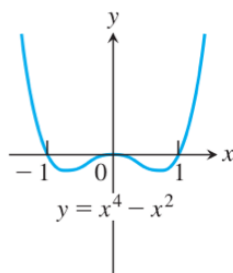**Q 5.** *Solve for angle $\theta$, where $0 \le \theta \le 2\pi$*

$$\cos 2\theta + \cos \theta = 0.$$

**Q 6.** *Find the domain and range for each function*

$$a)\ g(x) = \frac{3}{1 - e^{2x}} \qquad b)\ h(x) = \log \frac{x^2 - 3x + 2}{x + 1}.$$

**Q 7.** *For the functions given by a graph and formulas in below determine whether it is one-to-one.*

*a)*



$y = x^4 - x^2$

*b) $f(x) = x^2 - 2x$*          *c) $g(t) = 1/t$.*

**Q 8.** *For the following function*

$$\log_a(x + \sqrt{x^2 + 1}), \quad (a > 0, \ a \neq 1)$$

*a) show that it is symmetric about the origin.*
*b) find the inverse if exists.*

**Q 9.** *Find $f^{-1}(x)$ and identify the domain and range of $f^{-1}(x)$ for the following function*

$$f(x) = \frac{x + 2}{x - 3}.$$

*As a check show that*

$$(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x.$$