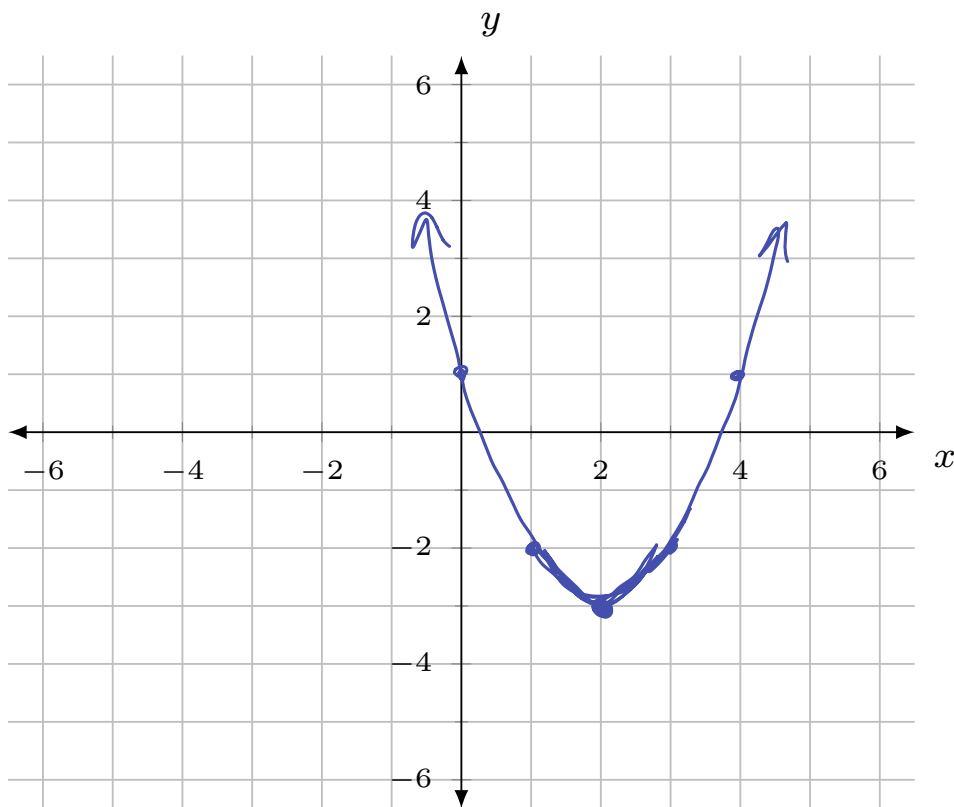*Answer Key (Final Answers Only)*

1. Find the quadratic function that has vertex $(3, 2)$ and passes through $(1, 5)$.

$$f(x) = \frac{3}{4}(x-3)^2 + 2$$

2. Graph the polynomial $x^2 - 4x + 1 = (x-2)^2 - 3$

3. We want to build a rectangular pen that borders a river on one side. We have 120 feet of fence to work with. What is the maximum area that can be enclosed?

See the <u>online notes</u> on section 3.1.

4. Describe the end behavior of the polynomial function $f(x) = (x+1)(x+4)^2(x-4)$.

$\cdots$ • $f(x) \to \infty$ as $x \to -\infty$. (up & to the left)
• $f(x) \to \infty$ as $x \to \infty$. (up & to the right)

5. Find the set of possible rational zeros of the function $6x^4 - 7x^2 + 18x + 14$.

$\pm 1, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm 2, \pm \frac{2}{3}, \pm 7, \pm \frac{7}{2}, \pm \frac{7}{3}, \pm \frac{7}{6}, \pm 14, \pm \frac{14}{3}$

6. Given that 3 is a zero of the polynomial $x^3 - 7x^2 + 13x - 3$, find the other zeros.

Other zeros : $2 + \sqrt{3}, 2 - \sqrt{3}$

7. A degree 3 polynomial $f(x)$ has zeroes 3 and $5 + 3i$. Find $f(x)$. You do **not** have to simplify.

$f(x) = (x-3)(x - (5+3i))(x - (5-3i))$

8. Find the vertical and horizontal asymptotes, if any, and the domain of the rational function $f(x) = \dfrac{x^2 - 4}{(x+2)(x+1)}$.

V.a. : $x = -1$

h.g : $y = 1$

domain : $(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$

9. Find the inverse function, f^{-1}, of the rational function $f(x) = \dfrac{x+3}{x-4}$. Also give the ranges for both f and f^{-1}.

- $f^{-1}(x) = \dfrac{4x+3}{x-1}$

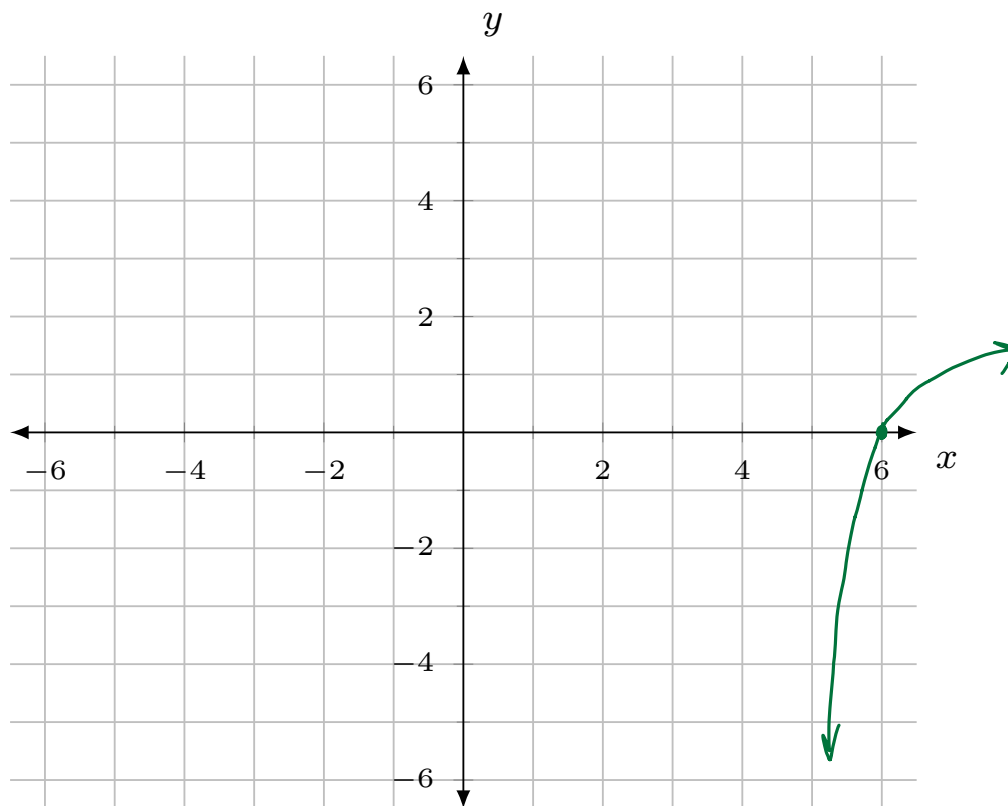- range of f : $(-\infty, 1] \cup (1, \infty)$

- range of f^{-1} : $(-\infty, 4) \cup (4, \infty)$

10. You invest \$300 into a savings account at an annual interest rate of 2% that compounts monthly. How much money will be in the account after 4 years?

$$A = (300)\left(1 + \frac{.02}{12}\right)^{(4)(12)}$$

11. Graph the logarithmic function $f(x) = \ln(x - 5)$.

12. Evaluate the following expressions:

(a) $\log \dfrac{1}{100}$ $= -2$

(b) $\ln \dfrac{e^{2x}}{e^3}$ $= 2x - 3$

(c) $3^{\log_5 25} - 3\log_{x^2} x^4$ $= 3$

13. Given that $\log x = 4$ and $\log y = 2$, evaluate the following:

(a) $\dfrac{\log x^2 y}{\log x}$ $= \dfrac{5}{2}$

(b) $\log \sqrt[5]{\dfrac{x^3}{y^2}} = \dfrac{8}{5}$

14. Write the following in expanded form:

(a) $\log \dfrac{\sqrt{x+9}}{x+1}$ $= \dfrac{1}{2}\log(x+9) - \log(x+1)$

(b) $\log_a(xy^2z^3)$ $= \log_a x + 2\log y + 3\log z$

15. Write the following expressions in condensed form:

(a) $\dfrac{3}{2}\ln y^2 + 3\ln x$ $= \ln\left(\sqrt{y^6}\, x^3\right)$

(b) $\dfrac{1}{5}(\log_2 z + 2\log_2 y) \quad = \quad \log_2\left(\sqrt[5]{z}\; y^2\right)$

16. Solve for x in the following exponential and logarithmic equations:

(a) $3^{3x+1} = 5^{2x+1}$

$$x = \frac{\ln 5 - \ln 3}{3\ln 3 - 2\ln 5}$$

(b) $\log_2(x+4) - \log_2(x+3) = 1$

$$x = -2$$