AMAT100: Precalculus
Worksheet 3

Due: Monday, March 11, (MW) or Tuesday, March 12, (TTh) in Class or digitally

—— Instructions ——

- This homework should be submitted in class or digitally on the date listed above.
- There are three main ways you might want to write up your work.
  - Write on this pdf using a tablet
  - Print this worksheet and write in the space provided
  - Write your answers on paper, clearly numbering each question and part.
    - If using either of the last two options, you can use an app such as Microsoft Lens to take pictures of your work with your phone and convert them into a single pdf file.
- **You must show all work**. You may receive zero or reduced points for insufficient work. **Your work must be neatly organised and written**. You may receive zero or reduced points for incoherent work.
- If you are writing your answers on anything other than this sheet, you should only have **one question per page**. You can have parts a), b) and c) on the page for example, but problems 1) and 2) should be on separate pages.
- **Put a box or circle around your final answer** for each question.
- The problems on this assignment will be **graded on correctness and completeness**.
- These problems are designed to be done without a calculator. Whilst there is nothing stopping you using a calculator when working through this assignment, be aware of the fact that you are not permitted to use calculators on exams so you might want to practice without one.

1. Consider the quadratic function $Q(x) = 7x^2 - 28x + 23$.

   (a) Rewrite $Q(x)$ in the form $a(x-h)^2 + k$.

   (b) What is the maximum value of $Q(x)$?

   (c) What is the y-intercept of the graph of $Q(x)$?

   (d) What are the zeros of $Q(x)$?

2. (a) Identify the zeroes and its multiplicities for the function:

$$p(x) = (x - 545)^5(x + 46)^4(x - \pi)^3 \left(x - \frac{\pi}{4}\right) \left(x + \frac{1}{2}\right)^{2024}$$

(b) A power function is of the form $y = kx^p$, where k is the constant of proportionality and p is a real number. For each of the following functions determine whether it is a power function. In the case it is a power function, determine the values of k and p.

i. $L(x) = 7 \cdot \left(\frac{1}{2}\right)^x$

Is $L(x)$ a power function?_____.

If yes, then $k =$_____, $p =$_____.

ii. $P(x) = x^{4n}\sqrt{\frac{\pi}{7x^{2n}}}$

Is $P(x)$ a power function?_____.

If yes, then $k =$_____, $p =$_____.

3. Use long division to find the quotient and remainder. *Clearly show all steps.*

$$(15x^5 + 4x^4 + 2x^2 + 7) \div (x - 10)$$

4. Consider the rational function:

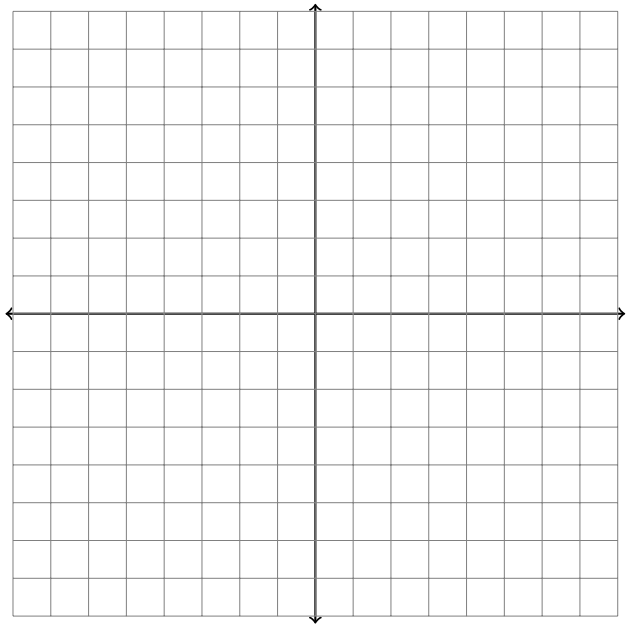
$$k(x) = \frac{x+1}{x(x-2)(x-3)(x+5)}.$$

(a) Find all x and y-intercepts of $k(x)$.

(b) Identify all vertical asymptotes of $k(x)$.

(c) Identify all horizontal asymptotes of $k(x)$.

(d) Sketch $k(x)$ clearly labeling all asymptotes and intercepts.



5. Consider the function $a(x) = \sqrt{14x + 20}$.

   (a) What is the domain of $a(x)$?

   (b) Find the inverse of $a(x)$.

   (c) What is the domain of $a^{-1}(x)$?

   (d) What is the range of $a(x)$?