

Math 110 – Chapter 3 – Worksheet 2 – Version A

The Complex Zeros of a Polynomial Function; Rational Functions; Variations

Section 3.5 The Complex Zeros of a Polynomial Function

1. Find the polynomial $P(x)$ of degree 4 with a leading coefficient of 3 and zeros $-2, 1, 1 + i, 1 - i$. Write $P(x)$ in factored form and then by expanding the product.
2. A polynomial $P(x)$ of degree 8 with real coefficients has the following zeros: -3 and $2 - 3i$, each of multiplicity 2 and i . Write all eight zeros.
3. Given that $2i$ is a zero of $P(x) = x^4 - 3x^3 + 6x^2 - 12x + 8$, find the remaining zeros.
4. Find all zeros of the polynomial $P(x) = x^4 - 8x^3 + 22x^2 - 28x + 16$.

Section 3.6 Rational Functions

5. Find the domain of the rational function $f(x) = \frac{x-3}{x^2-4x-5}$.
6. Find the vertical and horizontal asymptotes and graph each function, state the domain and range.
 - a) $g(x) = \frac{3}{x-2}$
 - b) $h(x) = \frac{2x+5}{x+1}$
7. Find the vertical asymptotes of the graph of $f(x) = \frac{x+1}{x^2+3x-10}$.
8. Find all vertical asymptotes of the graph of $f(x) = \frac{3-x}{x^2-9}$.
9. Find the horizontal asymptote (if any) of the graph of each function.
 - a) $f(x) = \frac{2x-5}{3x+4}$
 - b) $g(x) = \frac{x^2+3}{x-1}$
 - c) $h(x) = \frac{100x+57}{0.01x^3+8x-9}$
10. Sketch the graph of $f(x) = \frac{2x}{x^2-1}$.
11. Sketch the graph of $f(x) = \frac{2x^2-1}{2x^2+x-3}$.
12. Sketch the graph of $f(x) = \frac{x^2+1}{x^2+2}$.
13. Sketch the graph of $f(x) = \frac{x^2+2}{x-1}$.
14. The revenue curve for an economy is given by $R(x) = \frac{x(100-x)}{x+10}$ where x is the tax rate and $R(x)$ is the revenue in billions of dollars.
 - a) Find and interpret $R(10), R(20), R(30), R(40)$, and $R(60)$.
 - b) Sketch the graph of $y = R(x), 0 \leq x \leq 100$.

Section 3.7 Variations

15. Suppose y varies directly as x . If $y = 6$ when $x = 30$, find y when $x = 120$.
16. The current in a circuit connected to a 220-volt battery is 60 amperes. If the current is directly proportional to the voltage of the attached battery, what voltage battery is needed to produce a current of 75 amperes?

17. Suppose y varies directly as the square of x . If $y = 48$ when $x = 2$, find y when $x = 5$.
18. Suppose y varies inversely as x . If $y = 12$ when $x = 5$, find y when $x = 3$.
19. Suppose y varies inversely as the square root of x . If $y = \frac{3}{4}$ when $x = 16$, find x when $y = 2$.
20. Newton's Law of Universal Gravitation says that every object in the universe attracts every other object with a force acting along the line of the centers of the two objects. Also, this attracting force is directly proportional to the product of the two masses and inversely proportional to the square of the distance between the two objects. Write the law symbolically.
21. The mass of Mars is about 6.42×10^{23} kilograms and its radius is 3397 kilometers. What is the acceleration due to gravity near the surface of Mars?