MA 110 COLLEGE ALGEBRA
PRACTICE TEST TWO
Sctns: 2.4, 2.5, 2.6, 3.1, .3.2, 3.3, 3.7, 4.1, 4.2, 4.3, 4.4.

1. Graph each quadratic equation function by hand by determining whether its graph opens up or down and by finding its vertex, axis of symmetry, x-intercepts, domain, and range the interval over which the function is increasing and on which it is decreasing. Verify your results using a graphing utility. [2.4, 2.5]

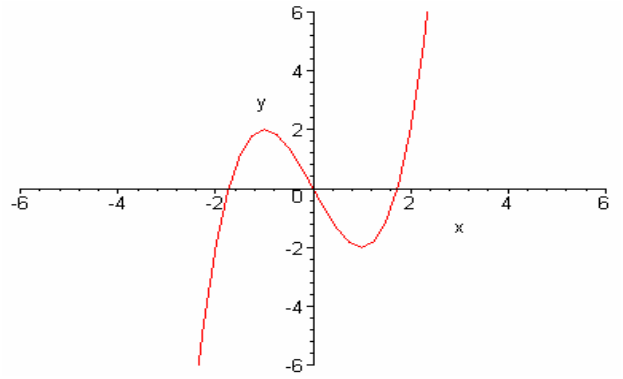
a. $f(x) := 1 - 6x - x^2$

b. $f(x) := x^2 - 8x + 13$

c. $f(x) := .5x^2 - 4x + 10$

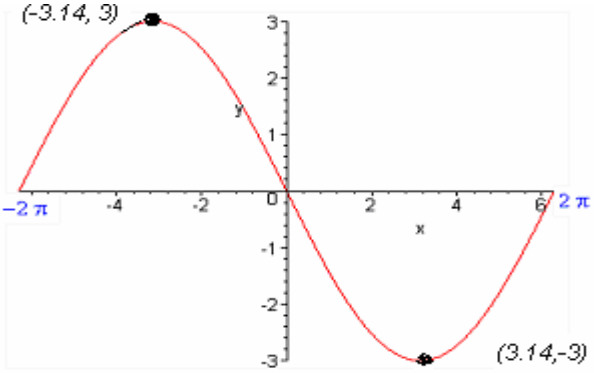
2. Find the x-intercept (s), the y-intercept (s), the domain, and range of the graph given below. [2.4, 2.5]

$f := x \to x^3 - 3x$



3.

$y := 3\sin\left(\frac{1}{2}x + \pi\right)$



[2.4, 2.5]

Use the graph above to find:

a) the intercept(s) if any

b) its domain and range

4. Draw a complete graph of the following function by first identifying the end behavior and x- and y-intercepts, then using any additional points needed to complete the graph.

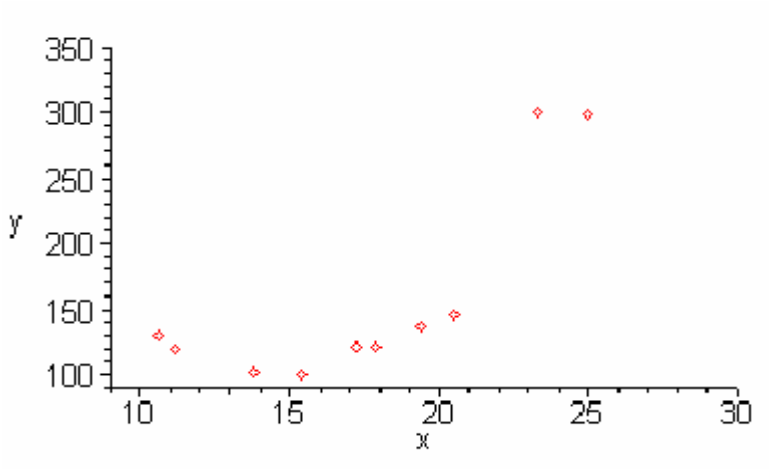
$r(x) = -2\sqrt[3]{x+3} + 4$ [2.4]

Applications

Curve Fitting Exercise 5-6 show scatter diagrams of sets of data. In each case, tell whether a linear or quadratic model is appropriate for the data. For the linear model, decide whether the slope should be positive or negative. For the quadratic model, decide whether the coefficient *a* should be positive or negative. [2.4, 2.5, 3.1]

5.

6.



7. **Analyzing the Motion of a Projectile** A projectile is fired from a cliff 200 feet above the water at an inclination of 45^0 to the horizontal, with a muzzle velocity of 50 feet per second. The height *h* of the projectile above the water is given by

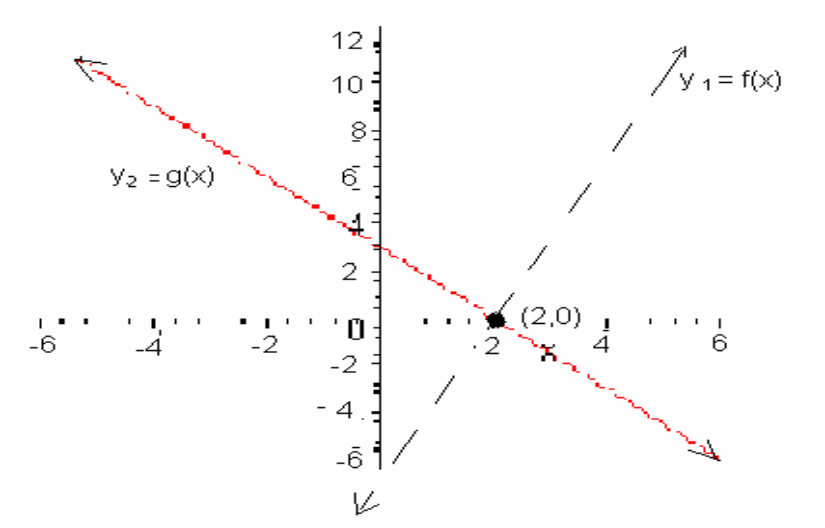
$$h(x) = \frac{-32x^2}{(50)^2} + x + 200$$

a) where x is the horizontal distance of the projectile from the base of the cliff.
b) How far from the base of the cliff is the height of the projectile a maximum?
c) Find the maximum height of the projectile.
d) How far from the base of the cliff will the projectile strike the water?
e) When the height of the projectile is 100 feet above the water, how far is it from the cliff? [2.4, 2.5, 3.1]

8. Use the figure to solve each equation or inequality. [2. 5]

a) f(x) = g(x) b) f(x) $\leq$ g(x)

c) f(x) > g(x) d) $y_2 - y_1 = 0$



9. The Effect of Advertising on Movie Revenue. The following table contains actual data pertaining to the box office revenue of certain movies together with the amount of money that was spent to advertise each movie. We want to explore whether box office revenue is directly related to advertising expenditures. [2.6]

Movie	Advertising Budget (in millions)	Box Office Revenue (in millions)
The Lion King	23.3	300.4
Forrest Gump	25.0	298.5
True Lies	20.5	146.3
The Santa Clause	19.4	137.8
The Flintstones	10.6	130.6
Clear & Present	17.9	121.8
Danger	17.2	121.2
The Mask	11.2	118.8
Maverick	13.8	101.6
Interview with the Vampire	15.4	100.7

Source: The Hollywood Reporter.

a) Make a scatter plot of the data.

b) Analyze the scatter plot and determine whether a linear, quadratic, cubic or quartic equation might fit the data.

c) Use the regression feature on a grapher to find a quadratic, a cubic, a quartic function to fit the data. Assume the advertising is the independent variable.

d) Compare the results and try to decide which function fits the best.

e) Use the quadratic function to predict the advertising budget when the box office revenue is 250 million.

10. For the functions p and q given, (a) compute the product H(x) = (p.q) (x), (b) evaluate H (-2) and H (3), and (c) determine the domain of H. [3.1]

p(x) = $\sqrt{x+5}$ and q(x) = $\sqrt{x-2}$

11-15. Let f(x) = $\frac{3}{x-1}$ and g(x) = $\frac{2}{x}$, Evaluate the expression [3.1]

11. Find h(x) = $(f \circ g)(x)$; (f 0 g)(-7)

12. State the domain of composite function.

13. f (-1) - g (-1)

14.(f 0 g)(-3)

15. (f 0 f)(-3)

16. Let f and g be two functions defined as

f (x) = x +2 and g (x) = 3-x . Find

a) f (x) + g (x), b) f(3) +g(3), c) f(-3) +g(-3),

d) f (x) -g (x), e) f(-3) - g(-3). [3.1]

17. Find h(x) = $\left(\frac{f}{g}\right)(x)$ and determine the domain of h. [3.1]

f(x) = $x^2 - 1$ and g(x) = $\sqrt{16 - x^2}$

18.

x	f(x)	g(x)
-2	0	6
0	5	0
2	7	-2
4	10	5

Use the table to evaluate each expression, if possible.

a) (f+g) (2)

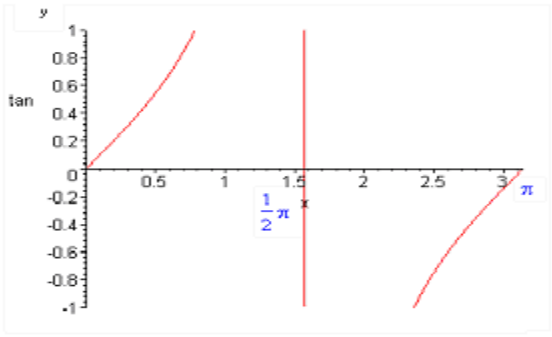
b) (f-g)(4)

c) (fg)(-2)

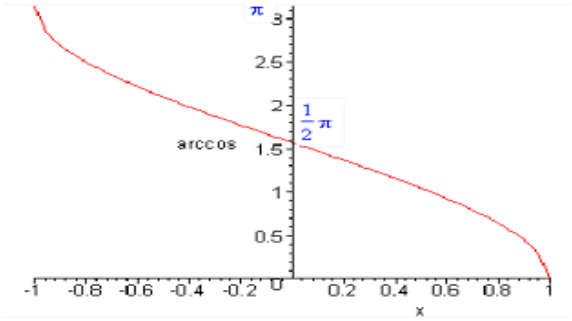
d) $\left(\frac{f}{g}\right)(0)$

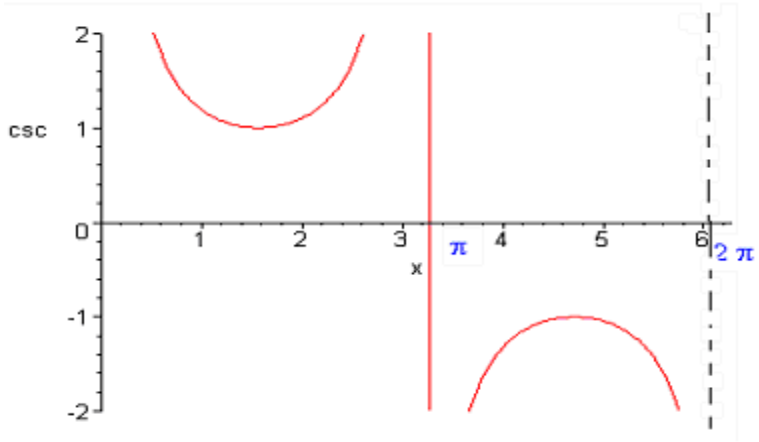
19-22. Decide whether each function graphed or defined is a one-to-one. [3.2]

19.



20.



21. 

22. $g(x) := (x-1)^2 + 4$, $x \geq 1$

23 - 25. For each function defined as follows that is one - to - one, write an equation for the inverse function in the form $y = f^{-1}(x)$, and then graph f and f^{-1} on the same axes. Give the domain and range of f and f^{-1}. If the function is not one - to - one, say so. [3.2]

23. $f(x) := x^3 - 1$

24. $f(x) := \frac{1}{x-2}$

25. $f(x) := 3x^2$

26. Describe the transformations that will yield the graph of the given function from the graph of the function $f(x) = x^2$. [3. 3]

a) $f(x) := (x+2)^2 + 2$

b) $f(x) := -2x^2 + 3$

c) $f(x) := -2(x-4)^2 - 3$

27. Compare the graph of each function with the graph of $f := \sqrt{x}$. [3. 3]

a) $g(x) := -\sqrt{x}$

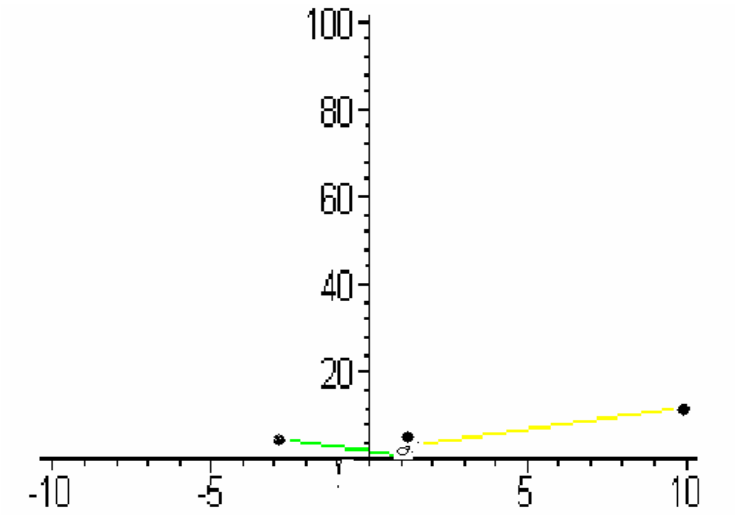
b) $h(x) := \sqrt{-x}$

For the piecewise-defined function, find (a) f (-4), (b) f(-1), © f(0), (d) f(3). [3.7]

28.

$$f(x) = \begin{cases} x^2 & \text{if } -4 \le x < -3 \\ 2-x & \text{if } -3 < x < 1 \\ 2+x & \text{if } 1 \le x \le 10 \end{cases}$$

29. Give the domain and range of the piecewise-defined function. [2. 5]



30-32. Use synthetic division to determine whether the given number is a zero of the polynomial. [4.1, 4.2, 4.3]

30. f(-1); $f(x) := 3x^4 - 6x^2 + 3$

31. f(½); $f(x) := 2x^3 - 11x^2 + 13x - 4$

32. f(-3/2); $f(x) := 2x^5 + x^4 + x^3 + 13x^2 + 5x - 6$

33-34. Use synthetic division to find f(a). [4.1, 4.2, 4.3]

33. a = 2; $f(x) := 3x^4 - 6x^2 + 3$

34. a = -1; $f(x) := 2x^5 + x^4 + x^3 + 13x^2 + 5x - 6$

35-37. For each polynomial, one zero is given. Find all others analytically.

35. $f(x) := 2x^4 + 7x^3 - 4x^2 - 27x - 18$; -3/2

36. $f(x) := x^4 - 5x^3 + 10x^2 - 20x + 24$; -2i

37. $f(x) := x^4 - 3x^3 + 5x^2 - x - 10$; 1+2i

Factor $f(x) = x^4 - 3x^3 + 5x^2 - x - 10$ into linear factors given that k is a zero of P. [4.1, 4.2, 4.3]

38. k = 1-2*i*

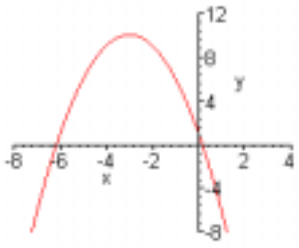
39-40. Find all zeros (real and complex) of the polynomials given [4.1, 4.2, 4.3]

39) $x^4 - 81$

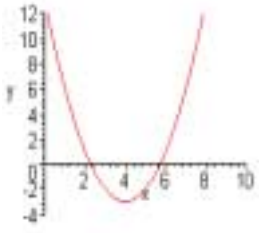
40) $F(x) = x^4 - 9x^3 + 21x^2 + 21x - 130$

41. Sketch and form a polynomial f (x) with real coefficients having the given degree and zeros. Degree: 8; zeros: 0 multiplicity of 2; 3 with multiplicity of 3; -1/2 with multiplicity of 1; 1 with multiplicity of 2. Label y and x-intercepts. [4.2, 4.3, 4.4]

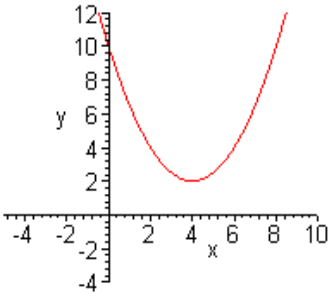
Answers:

1a) 

Opens downward; Vertex: (-3,10)
Axis of symmetry: x = -3; x - intercepts: -6.16, 0.16;
Domain: (-∞, ∞); Range: (-∞, 10]; Increasing: (-∞, -3]; Decreasing: [-3, ∞).

b) 

Opens upward Vertex: (4, -3); Axis of symmetry: x = 4;
x-intercepts: 2.3, 5.7; Domain: (-∞ , ∞); Range: [-3, ∞); Increasing: [4, ∞);
Decreasing: (- ∞, 4].

c. 

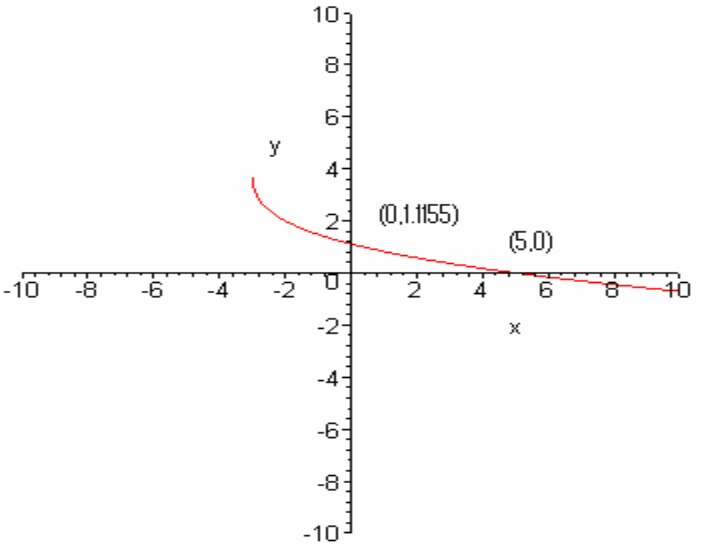
Opens upward; Vertex: (4, 2); Axis of symmetry: x = 4; x-intercepts: none;
Domain: (-∞,∞); Range: [2, ∞); Increasing: [4, ∞); Decreasing: (- ∞, 4].

2. x-intercept: 0, $+\sqrt{3}$; y-intercept is 0. Domain: all reals; Range: all reals

3. a) x –intercept: $\{\pm 2\pi, 0\}$; y –intercept: [0, 0];

b) Domain: $[-2\pi, 2\pi]$
Range [-3, 3]

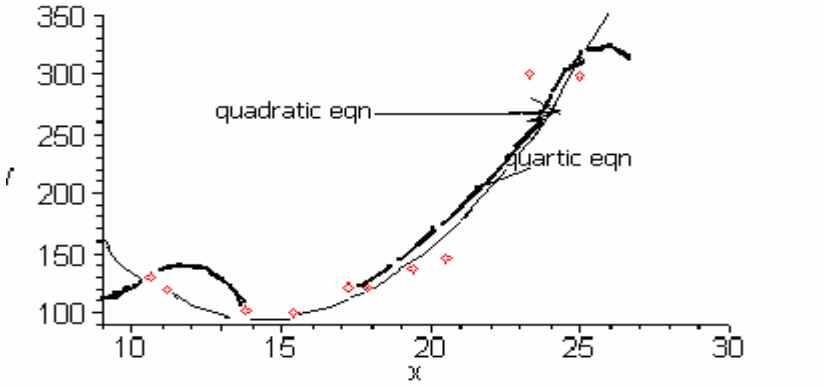
4. $r(x) = -2\sqrt[3]{x+3} + 4$



5) Linear; negative; 6) Quadratic: a >0

7. a) $\frac{625}{16} \approx 39$ft b) 219.5 ft c) 170 ft d) When the height is 100 ft, the projectile is 135.7 ft from the cliff.

8a) {2}, b) (- ∞, 2], c) (2, ∞), d) {2}



9. a)

b) Linear seems inappropriate; quadratic, cubic, quartic seem possible.
c) Quadratic: $y = 2.0319x^2 - 59.041796x + 527.28$
Cubic: $y = -0.0274x^3 + 3.4889x^2 - 83.77x + 660.291$; Quartic: $y = -0.04036x^4 + 2.8429x^3 - 70.9686x^2 + 749.2437x - 2721.56$
d) The quadratic and cubic equation seem to fit the best. They indicate that , for an advertising budget of about $16 million or greater, box office revenue increases as the budget increases. The quartic equation indicates that revenue declines sharply as the advertising budget increases beyond about $25.5 million.
e) The advertising budget is 23.17 million.

10 a) H(x) = $\sqrt{(x+5)(x-2)}$; b) H(-2) = is not a real number; $2\sqrt{2}$ c) $x \in [2,\infty)$

11. (f ₀ g) (x) = $\frac{3x}{2-x}$; (f ₀ g)(-7) = -7/3.

12. Domain: {x / x ≠ 0, x ≠ 2}

13. f (-1)- g (-1) = ½

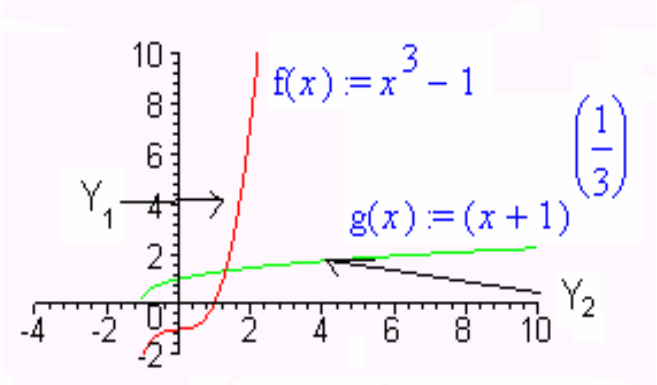
14. (f ₀ g) (-3) = -9/5; 15) (f ₀ f) (-3) = -12/7.

16. a) f (x) + g (x) = 5; b) f(3) +g(3) =5

c) f(-3) +g(-3) = 5; d) f (x) -g (x) = 2x-1; e) f(-3) - g(-3) = -7.

17. H(x) = $\frac{x^2-1}{\sqrt{16-x^2}}$; $x \varepsilon (-4,4)$ 18 a) 5 b) 5 c) 0 d) Undefined

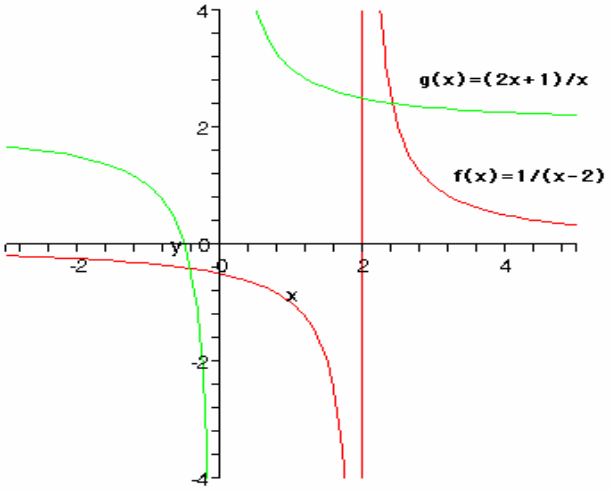
19. Yes. 20. Yes. 21. Not a one - to - one. 22. Yes.

23. 

Domain f = Range f^{-1} = $(-\infty, \infty)$

Range f = Domain f^{-1} = $(-\infty, \infty)$

24.



Domain f = Range f^{-1} = All real numbers except 2

Range f = Domain f^{-1} = All real numbers except 0

25. Not one - to - one.

26. a) $f(x) := (x+2)^2 + 2$ ---→ horizontal shift 2 units left; vertical shift up 2 units.

b) $f(x) := -2x^2 + 3$ -------→ reflection about x-axis; stretch by factor of 2 and vertical shift up of 3 units.

c) $f(x) := -2(x-4)^2 - 3$ ----→ reflection about x axis; stretch factor of 2 ; horizontal

shift 4 units right; vertical shift 3 units down.

27. a) $g(x) := -\sqrt{x}$ ------→ the graph is a reflection on the x-axis.

b) $h(x) := \sqrt{-x}$ -------→ the graph is a reflection on the y-axis.

28. (a) f (-4) = 16; (b) f(-1) = 3; © f(0) = 2; (d) f(3) = 5.

29. Domain: [-3, 10]; Range: (1, 12]

30) Yes

31) Yes 32) No

33) 27

34) 0

35) -3, 2, -1

36) 2i, 2, 3.

37) 1-2i, 2, -1 38) $f(x) = x^4 - 3x^3 + 5x^2 - x - 10$ = (x-1-2i) (x-1+2i) (x+1) (x-2)

39. $\pm 3, -3i$

40. Zeros of 3-2i, -2, 5

41. $f(x) := -2x^2(x-3)^3(2x+1)(x-1)^2$ →

$-4x^8 + 42x^7 - 162x^6 + 268x^5 - 144x^4 - 54x^3 + 54x^2$