

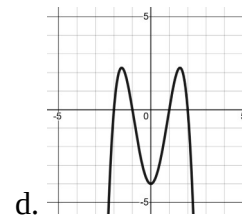
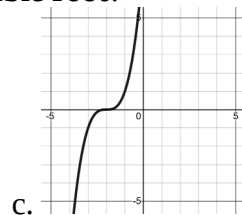
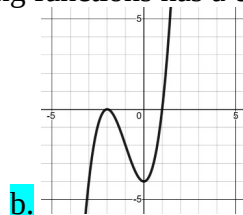
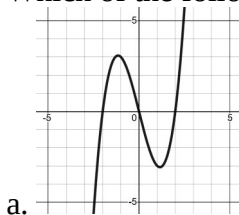
Practice Test – Polynomial Functions

Part A: Multiple Choice [K/U, 10 marks]

1. Which of the following functions has a degree of 4?
 a. $y = 4x^2 - 3x + 1$ b. $y = 4x^3 - 2x + 5$ c. $y = 3x^3 + x^2 - 6x + 5$ **d.** $y = 2x^4 + x^3 - 4x + 1$

2. What is the end behaviour of the function $y = -2x^3$?
 a. Q3 to Q1 b. Q2 to Q1 **c.** Q2 to Q4 d. Q3 to Q4

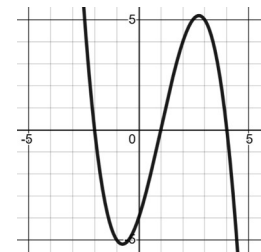
3. Which of the following functions has a **double root**?



4. From a table of values, the 3rd differences of a polynomial are 12. What is the **degree** of the function?
 a. 2 **b.** 3 c. 6 d. 12

5. From a table of values, the 3rd differences of a polynomial are 12. What is the **leading coefficient** of the function?
a. 2 b. 3 c. 6 d. 12

6. What is the equation of the cubic function, shown right?
 a. $y = \frac{1}{2}(x-2)(x+1)(x+4)$ b. $y = -\frac{1}{2}(x-2)(x+1)(x+4)$
 c. $y = \frac{1}{2}(x+2)(x-1)(x-4)$ **d.** $y = -\frac{1}{2}(x+2)(x-1)(x-4)$



7. What is the factored form of $x^2 + 8x + 12$?
 a. $(x+1)(x+12)$ **b.** $(x+2)(x+6)$ c. $(x+3)(x+4)$ d. $(x+3)(x+5)$

8. What is the factored form of $4x^2 - 9y^2$?
 a. $(2x-3y)(2x-3y)$ b. $(2x+3y)(2x+3y)$
c. $(2x-3y)(2x+3y)$ d. $(2x^2-3y)(2x+3y^2)$

9. What is the factored form of $x^3 - 7x^2 - 5x + 35$?
a. $(x-7)(x^2-5)$ b. $(x+7)(x^2-5)$ c. $(x-7)(x^2+5)$ d. $(x+7)(x^2+5)$

10. What type of factoring should you always try first?
a. Common b. Grouping c. Trinomial d. Fear

Part B: Definition / Short Answer

1. Given the **degree** and the **leading coefficient** of a polynomial function, describe how you determine the end behaviour of the function. [2]

| | Odd Degree | Even Degree |
|----------------------|------------|-------------|
| Positive Coefficient | Q3 to Q1 | Q2 to Q1 |
| Negative Coefficient | Q2 to Q4 | Q3 to Q4 |

2. Explain the connection between the **degree**, **leading coefficient**, and the **constant finite differences** and a polynomial function. [2]

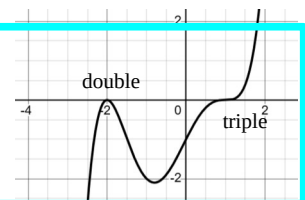
The degree determines which finite difference is constant. (For example, a 3rd degree function has the 3rd differences constant.)

$$\begin{aligned} (\text{constant difference}) &= (\text{leading coefficient}) \times (\text{degree})! \\ (\text{constant difference}) &= a \cdot n! \end{aligned}$$

3. Explain how to identify a **double root** and a **triple root** on a graph. [2]

A double root “bounces” of the axis.

A triple root does the “lightning bolt” through the axis.



4. Describe how to determine the **equation** of a polynomial function from it’s graph. [2]

Identify the roots and create the corresponding factors. [i.e. a root of -2 gives $(x + 2)$].
Write the factored form, $y = a() () \dots ()$.
Solve for a by substituting in another point (*not* a root).
Write the equation.

5. List the sequence of factoring we learned in this unit. [2]

- Common Factor
- Factor by Grouping
- “Advanced” Trinomial
- Simple Trinomial
- Difference of Squares
- Complex Trinomial (Decomposition)

Part C: Problem Solving [ATIPS, 20 marks]

Complete any 5 of 6 problems.

1. Determine the degree and leading coefficient of the following function. [4]

| x | y | 1^{st} | 2^{nd} | 3^{rd} |
|-----|------|----------|----------|----------|
| 0 | 300 | | | |
| 1 | 301 | 1 | | |
| 2 | 290 | -11 | -12 | |
| 3 | 255 | -35 | -24 | -12 |
| 4 | 184 | -71 | -36 | -12 |
| 5 | 65 | -119 | -48 | -12 |
| 6 | -114 | -179 | -60 | -12 |

The degree is 3.

$$a \times n! = -12$$

$$a \times 3! = -12$$

$$6a = -12$$

$$a = -2$$

The leading coefficient is -2.

2. Sketch the graph of $y = \frac{1}{2}(x-4)(x+2)(x-2)$. [4]

x-intercepts are 4, -2, and 2.

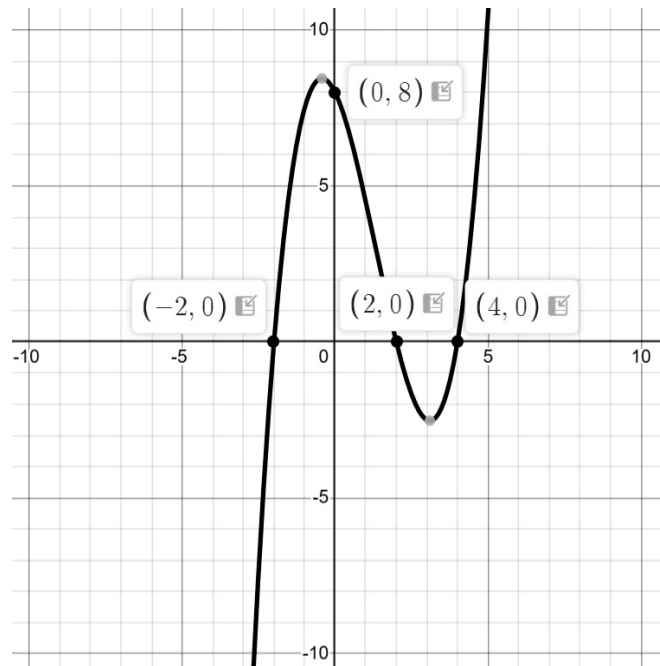
y-intercept:

$$y = \frac{1}{2}(0-4)(0+2)(0-2)$$

$$y = \frac{1}{2}(-4)(2)(-2)$$

$$y = 8$$

End behaviour is Q3 to Q1.



3. Determine the equation of the graph shown. [4]

Roots are -1, 1 (double), and 3.

$$y = a(x+1)(x-1)^2(x-3)$$

Sub in point (0, -6) [or (2,-6)] to solve for a :

$$-6 = a(0+1)(0-1)^2(0-3)$$

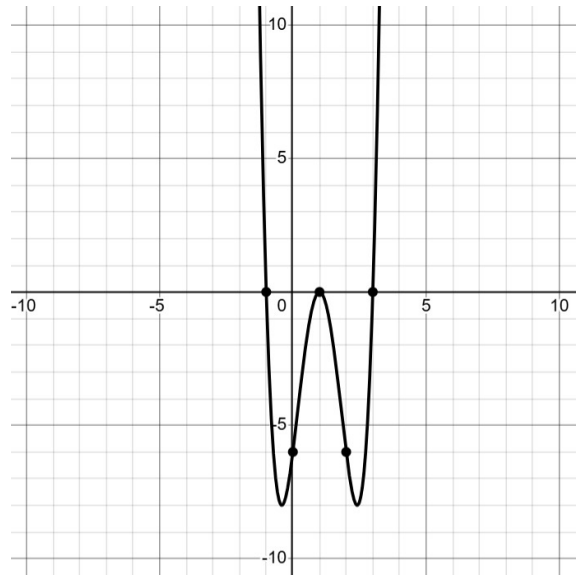
$$-6 = a(1)(-1)^2(-3)$$

$$-6 = a(1)(1)(-3)$$

$$-6 = -3a$$

$$2 = a$$

The equation is: $y = 2(x+1)(x-1)^2(x-3)$



4. Factor. [4]

a. $2x^2 - 30x + 100$

$$= 2(x^2 - 15x + 50)$$

$$= 2(x-5)(x-10)$$

b. $4x^3 - 8x^2 - 9x + 18$

$$= 4x^2(x-2) - 9(x-2)$$

$$= (x-2)(4x^2 - 9)$$

$$= (x-2)(2x-3)(2x+3)$$

5. The expression for the area of a rectangle is $A = 2x^2 + 13x + 15$.

a. Determine expressions for the length and width of the rectangle.

$$A = 2x^2 + 13x + 15 \quad \text{M:30 A:13 N:10,3}$$

$$A = 2x^2 + 10x + 3x + 15$$

$$A = 2x(x+5) + 3(x+5)$$

$$A = (x+5)(2x+3)$$

$$L = (2x + 3)$$

$$W = (x + 5)$$

b. Determine the dimensions if $x = 4$.

$$L = (2(4) + 3) = 11$$

$$W = (4 + 5) = 9$$

The dimensions are 11 by 9.

6. The formula for the surface area of a cylinder is $SA = 2\pi r^2 + 2\pi r h$.

a. Determine the surface area if the radius is 6cm and the height is 7cm.

$$SA = 2\pi(6)^2 + 2\pi(6)(7)$$

$$SA = 2\pi(36) + 2\pi(42)$$

$$SA \approx 490.1 \text{ cm}^2$$

b. Determine the height if the radius is 10cm and the surface area is 785.4cm².

$$785.4 = 2\pi(10)^2 + 2\pi(10)h$$

$$785.4 = 628.3 + 20\pi h$$

$$157.1 = 20\pi h$$

$$2.5 = h$$