


**FUNCTIONS & DOMAIN**


 **MEMORIZE:** Domain = set of all possible  $x$ -values

 **EXAMPLE:**  $f(x) = \sqrt{x-3} \rightarrow$  domain  $x \geq 3$

1. Find the domain of  $f(x) = \frac{1}{\sqrt{x+5}}$ . Express in interval notation.

**INVERSE FUNCTIONS**


 **MEMORIZE:**  $f(f^{-1}(x)) = x$

 **EXAMPLE:**  $f(x) = 2x+3 \rightarrow f^{-1}(x) = (x-3)/2$

2. If  $f(x) = 3x - 7$ , find  $f^{-1}(5)$ .

**POLYNOMIAL LONG DIVISION**

 **MEMORIZE:** Dividend = Divisor  $\cdot$  Quotient + Remainder

 **EXAMPLE:**  $(x^2+3x+2)/(x+1) = x+2$

3. Divide  $(x^3 - 2x^2 - 5x + 6)$  by  $(x - 3)$ . What is the quotient?

 EXPONENTIAL & LOG MEMORIZE:  $\ln(e^k) = k$  EXAMPLE:  $e^{2x}=7 \rightarrow 2x=\ln 7$ 

4. Solve for  $x$ :  $e^{2x+1} = 10$ . Give exact value using natural log.

 TRIGONOMETRIC VALUES MEMORIZE:  $\sin(\pi/3) = \sqrt{3}/2$  EXAMPLE:  $\cos(\pi/4) = \sqrt{2}/2$ 


5. Evaluate exactly:  $\sin(225^\circ)$  in simplified radical form.

 TRIG IDENTITIES MEMORIZE:  $\sin^2\theta + \cos^2\theta = 1$  EXAMPLE: If  $\sin\theta=3/5$ ,  $\cos\theta=\pm 4/5$ 

6. If  $\cos\theta = 2/3$  and  $\theta$  is in Quadrant IV, find  $\sin\theta$  exactly.

 LAW OF SINES

 MEMORIZE:  $a/\sin A = b/\sin B = c/\sin C$

 EXAMPLE:  $A=30^\circ, a=10, b=20 \rightarrow \sin B=1 \rightarrow B=90^\circ$

7. In triangle ABC, angle A =  $45^\circ$ , angle B =  $60^\circ$ , side a = 8. Find side b exactly.

 VECTORS / DOT PRODUCT


 MEMORIZE:  $u \cdot v = |u| |v| \cos \theta$

 EXAMPLE:  $u=(2,3), v=(-1,4) \rightarrow u \cdot v=10$

8. Find the dot product of  $u = \langle 3, -2 \rangle$  and  $v = \langle 4, 5 \rangle$ .

 PARAMETRIC EQUATIONS

 MEMORIZE: Eliminate parameter t

 EXAMPLE:  $x=2t, y=t^2 \rightarrow y=x^2/4$

9. Eliminate the parameter:  $x = t+2, y = t^2 - 1$ . Express y in terms of x.

**SEQUENCES (ARITHMETIC)**

MEMORIZE:  $a_n = a_1 + (n-1)d$

EXAMPLE:  $a_1=5, d=3 \rightarrow a_7=23$

10. Find the 12th term of arithmetic sequence: 7, 12, 17, 22, ...

**GEOMETRIC SERIES**

MEMORIZE:  $S_n = a_1(1-r^n)/(1-r)$

EXAMPLE:  $a_1=3, r=2, S_4=45$

11. Find the sum of the first 6 terms of geometric sequence: 5, 15, 45, ...


**LIMITS**

MEMORIZE: Limit of polynomial = direct substitution

EXAMPLE:  $\lim_{x \rightarrow 2} (x^2+1)=5$

12. Evaluate:  $\lim_{x \rightarrow 3} (x^2 - 2x + 4)/(x-1)$

**CONTINUITY**

 MEMORIZE:  $f(c) = \lim_{x \rightarrow c} f(x)$

 EXAMPLE: piecewise

13. For  $f(x) = \{ x^2 \text{ if } x \neq 2; 5 \text{ if } x = 2 \}$  is it continuous at  $x=2$ ? Answer Yes/No.

**COMPLEX NUMBERS**


 MEMORIZE:  $i^2 = -1$

 EXAMPLE:  $(3+2i)(1-i) = 5 - i$

14. Simplify  $(2 + 3i) - (5 - i)$  and write in  $a+bi$  form.

**POLAR COORDINATES**

 MEMORIZE:  $x = r \cos\theta, y = r \sin\theta$

 EXAMPLE:  $r=2, \theta=\pi/3 \rightarrow (1, \sqrt{3})$

15. Convert polar  $(r, \theta) = (4, 5\pi/6)$  to rectangular coordinates.

**CONIC SECTIONS (ELLIPSE)**

📌 MEMORIZE:  $x^2/a^2 + y^2/b^2 = 1$

📖 EXAMPLE: center (0,0)

16. Find the center of ellipse:  $(x-3)^2/16 + (y+2)^2/9 = 1$ .

**BINOMIAL THEOREM**

📌 MEMORIZE:  $(a+b)^n = \sum C(n,k)a^{n-k}b^k$

📖 EXAMPLE: Coefficient of  $x^2$  in  $(x+2)^3$


17. Find the coefficient of  $x^3$  in the expansion of  $(2x - 1)^5$ .

**RATIONAL FUNCTIONS (ASYMPTOTES)**


📌 MEMORIZE: Vertical asymptote where denominator=0

📖 EXAMPLE:  $f(x)=1/(x-2) \rightarrow VA x=2$

18. What is the horizontal asymptote of  $f(x) = (3x^2+1)/(x^2-4)$ ?

 LOGARITHMIC PROPERTIES MEMORIZE:  $\ln(ab) = \ln a + \ln b$  EXAMPLE:  $\ln(6) = \ln 2 + \ln 3$ 

19. Condense:  $2\ln x - \ln y + 3\ln z$  into single logarithm.

 SOLVING TRIG EQUATIONS MEMORIZE: General solutions EXAMPLE:  $\sin\theta = 1/2 \rightarrow \theta = \pi/6 + 2\pi k$  or  $5\pi/6 + 2\pi k$ 

20. Solve for  $\theta$  in  $[0, 2\pi)$ :  $2\cos^2\theta - 1 = 0$ .