Unit 1 · Precalculus Review Cheat Sheet

Unit 1 focus: functions, domain, graphs and transformations

1 KEY VOCABULARY

function	Each input has exactly one output.	$f(x) = x^2$
domain	Allowed inputs.	$\ln x$: x > 0
one-to-one	Passes the horizontal line test.	x^3
piecewise	Different rules on different intervals.	|x|

2 DOMAIN

No zero denominators, no negative even roots, no log of 0 or negatives.

Example: $f(x) = \frac{\sqrt{x+2}}{x-3}$
Root: x ≥ −2
Denominator: x ≠ 3
Answer: [−2, 3) ∪ (3, ∞)

3 COMPOSITION

Inside function first.

Example: $f(x) = \sqrt{x}$, $g(x) = x^2 + 5$; f(g(2))
g(2): 9
f(9): 3
Answer: 3

4 INVERSES

Swap x and y, solve for y.

Example: $f(x) = e^x + 1$
Swap: $x = e^y + 1$
Answer: $f^{-1}(x) = \ln(x - 1)$

5 PARENT GRAPHS

Function	Key feature
x^2	vertex (0, 0)
$\sqrt{x}$	starts at (0, 0)
$\frac{1}{x}$	asymptotes x = 0, y = 0
e^x	passes (0, 1), y = 0 asymptote
$\ln x$	passes (1, 0), x = 0 asymptote

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- f(x − h) shifts right.
- $f^{-1}(x) \neq \frac{1}{f(x)}$.
- Simplify before substituting.

✗ Common mistakes

- $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$: not true
- $(a+b)^2 = a^2 + b^2$: $a^2 + 2ab + b^2$
- $\ln(a+b) = \ln a + \ln b$: $\ln(ab) = \ln a + \ln b$

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More practice: exponentials, logarithms and trigonometry you will need

1 EXPONENT AND LOG RULES

Rule	Example
$\ln(ab) = \ln a + \ln b$	$\ln 6 = \ln 2 + \ln 3$
$\ln a^p = p \ln a$	$\ln x^3 = 3 \ln x$
$e^{\ln x} = x$, $\ln e^x = x$	$e^{\ln 5} = 5$

2 SOLVING WITH LOGS

Isolate the exponential, then take ln.

Example: $3e^{2x} = 12$
Isolate: $e^{2x} = 4$
ln: $2x = \ln 4$
Answer: $x = \ln 2 \approx 0.693$

3 UNIT CIRCLE ESSENTIALS

θ	sin · cos · tan
$\frac{\pi}{6}$	$\frac{1}{2} \cdot \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{3}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2} \cdot 1$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2} \cdot \frac{1}{2} \cdot \sqrt{3}$

4 TRIG IDENTITIES

Identity	Use
$\sin^2 x + \cos^2 x = 1$	simplify
$\sin 2x = 2 \sin x \cos x$	double angle
$\cos^2 x = \frac{1+\cos 2x}{2}$	power reduction (integrals)

5 FACTORING REVIEW

Look for GCF, difference of squares, trinomials.

Example: $x^3 - 9x$
GCF: $x(x^2 - 9)$
Answer: x(x − 3)(x + 3)

6 CHECK YOURSELF

- Is my calculator in radians?
- Did I state the domain?
- Did I simplify fully before moving on?
- Did I check my answer with a graph?