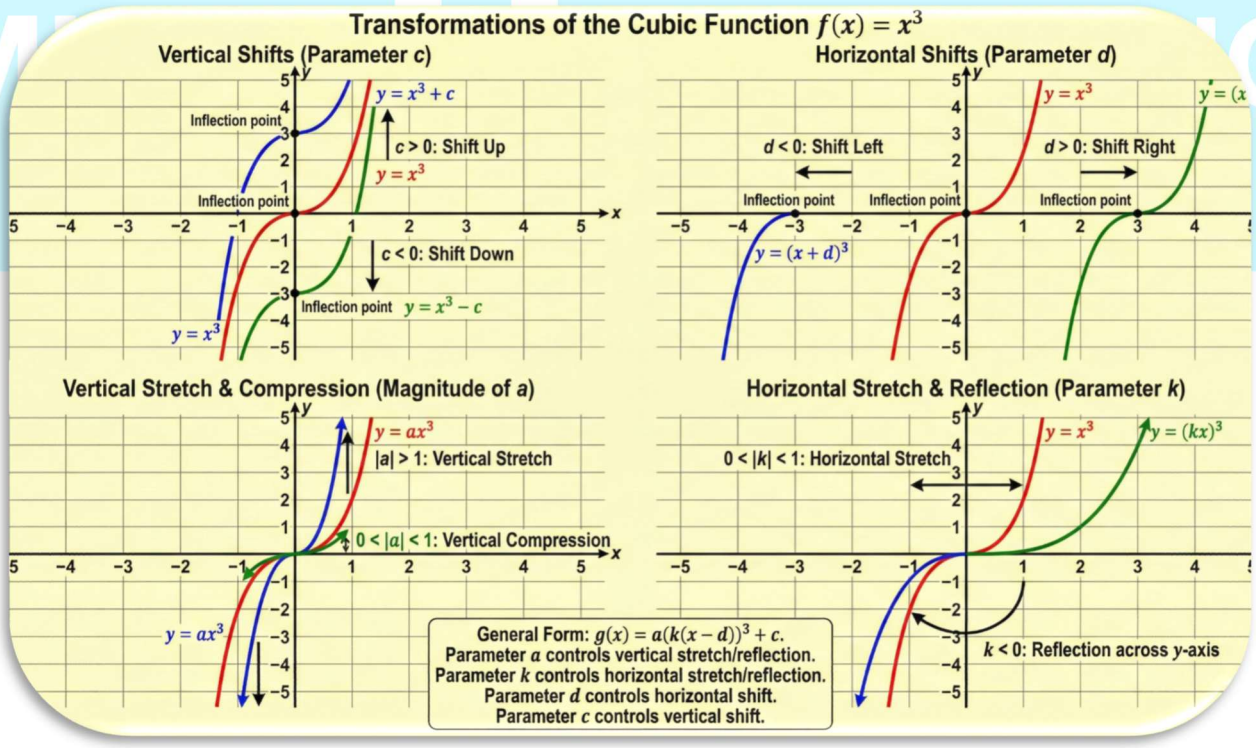
The "Big 5" Predicted Exam Questions (MCR3U)

The Concepts, The Traps, and The Fixes.

Note to Student: *These 5 questions represent the "bottlenecks" of the course. If you can solve these, you are ready for the exam.*

Question 1: The Transformation "Fake Out"

Concept: Function Transformations $y = \boldsymbol{a}f[\boldsymbol{k}(x - \boldsymbol{d})] + \boldsymbol{c}$



- The Problem:

Given the base function $f(x) = \sqrt{x}$, determine the equation of the transformed function $g(x)$ if it has been vertically compressed by a factor of $\frac{1}{2}$, reflected in the y-axis, and translated 6 units to the right.

- The Trap ☠️:

Writing the equation as $g(x) = \frac{1}{2}\sqrt{-x-6}$.

Why it fails: You applied the reflection ($k = -1$) and the shift ($d = -6$) separately without factoring.

- The Tutor's Fix ✅:

Always factor the k\$-value (the horizontal reflection/stretch) away from the x.

  - Step 1: Write the inside as $-(x-d)$.
  - Step 2: Since it is 6 units right, $d = 6$.
  - Correct Equation: $g(x) = \frac{1}{2}\sqrt{-(x-6)}$ or $g(x) = \frac{1}{2}\sqrt{-x+6}$

Question 2: The Ambiguous Case of Sine

Concept: Trigonometry (Sine Law)

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- The Problem:

In $\Delta ABC, \angle A = 30^o, a = 6\ cm, b = 10\ cm$. Find all possible $\angle B$.

- The Trap ☠️:

Using Sine Law to find $\angle B$, getting one answer $\approx 56^o$, and finishing the question. You just lost half the marks.

- The Tutor's Fix ✅:

Before you calculate, check the "Height", h.

$$h = b \sin A = 10 \sin 30^o = 5$$

Since side $a = 6\ cm$ is bigger than the height (5) but smaller than side $b = 10\ cm$, there are TWO possible triangles.

  - **Case 1:** $\angle B \approx 56^o$ (Acute).
  - **Case 2:** $\angle B = 180^o - 56^o = 124^o$ (Obtuse). *You must solve for both.*

Question 3: The "Impossible" Trig Identity

Concept: Trigonometric Identities

- The Problem:

Prove that: $\frac{\sin 2x}{1+\cos} = \tan x$

- The Trap ☠️:

Staring at the "1" in the denominator and getting stuck, or picking the wrong version of $\cos 2x$ (like $1 - 2\sin^2 x$), which makes the algebra messy.

- The Tutor's Fix ✅:

Your goal is to delete the "1" in the denominator.

  - Choose the double angle formula that has a "- 1" in it: $\cos 2x = 2\cos^2 x - 1$.
  - Substitute $\cos 2x$ in the denominator: $1 + \cos 2x = 1 + 2\cos^2 x - 1$.
  - The 1s cancel instantly. You are left with $\frac{2\sin x \cos x}{2\cos^2 x}$, which simplifies directly to $\frac{\sin x}{\cos x} = \tan x$.

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Question 4: The Annuity "Timing" Problem

Concept: Financial Math (Sequences & Series)

- The Problem:

You want to buy a car in 3 years. You deposit $200 at the end of every month into an account paying 6%/a compounded monthly.

- **The Trap ☠️:**
  1. Using the formula for *Present Value* (PV) instead of *Future Value* (FV).
  2. Forgetting to adjust the interest rate (i) and number of periods (n).
- The Tutor's Fix ✅:

Ask: "Do I have the money NOW (Loan) or LATER (Savings)?"

  - Savings = Future Value Formula.
  - **Adjust variables first:** $i = \frac{0.06}{12} = 0.005$. $n = 3 \times 12 = 36$
  - Only then plug into the formula.

Question 5: Simplifying Rational Expressions

Concept: Rational Functions & Restrictions

- The Problem:

Simplify and state restrictions: $f(x) = \frac{x^2-9}{x^2+5x+6}$

- The Trap ☠️:

Canceling out terms and then stating restrictions on the final answer only.

- The Tutor's Fix ✅:

Restrictions must be stated on the original denominator.

  - Factor top: $(x-3)(x+3)$.
  - Factor bottom: $(x+2)(x+3)$.
  - **STOP!** State restriction now: $x \neq -2, -3$.
  - *Now* cancel $(x+3)$.
  - Final Answer: $(x-3)(x+2), x \neq -2, -3$ (If you forget the -3, you lose the mark).

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Need help solving these? Book your Exam Rescue Session at mindlc.com