UNSTUCK

Course Material Summary

Quiz and Test Policies

- Quizzes are generally easier than tests because they cover less material and focus on the first half of the content ().
- Taking a quiz can help students assess their understanding and decide whether to continue or drop a course, especially if they perform well ().
- Quizzes may be optional; if not taken, they do not affect grades, but they can provide valuable feedback ().
- In some courses, a test can replace a quiz for that chapter, as per syllabus policies ().

Grading and Grade Calculation

- Quizzes and tests are often combined into a single category; their contribution depends on the total points assigned ().
- For example, a small quiz might be about 20% of the total quiz/test category ().

Class and Instructor Policies

- The instructor emphasizes honesty and transparency about absences and class content coverage ().
- Absences are sometimes unavoidable; students can request make-up sessions or review missed material ().
- The instructor values student engagement and makes efforts to create a positive classroom environment despite challenges like schedule constraints ().

Mathematical Concepts in Trigonometry

- Definitions of basic trig functions:
  - **Sine**: $\sin\theta = \frac{Y}{R}$ where Y is the y-coordinate, R is the radius ().
  - **Cosine**: $\cos\theta = \frac{X}{R}$ where X is the x-coordinate ().
  - **Cotangent**: $\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{X}{Y}$ ().
  - **Tangent**: $\tan\theta = \frac{Y}{X}$ ().
- When working with angles in standard position:
  - The angle's terminal side can be in any quadrant; signs of trig functions depend on the quadrant.
  - For example, in the second quadrant, $\sin\theta$ is positive, but $\cos\theta$ and $\tan\theta$ are negative ().
- Calculations involve the Pythagorean theorem:

$$x^2 + y^2 = r^2$$

to find coordinates on the unit circle or other circles ().

- Sign and cosine values are determined by the position of the angle:
  - For example, $\sin\theta = \frac{Y}{R}$, and the sign depends on the quadrant ().
  - When calculating $\cos\theta$, if the angle is in the second quadrant, $\cos\theta$ is negative, so the sign must be considered ().
- Rationalizing denominators:
  - Always rationalize if the denominator is rational; irrational denominators like π or e cannot be rationalized ().
- Trigonometric graphs:
  - The sine and cosine functions are periodic with period 2π.
  - The amplitude is the absolute value of the coefficient A in $A\sin\theta$ or $A\cos\theta$, representing the maximum distance from the midline ().
  - The midline is the horizontal line around which the graph oscillates; shifting the function vertically moves the midline ().
  - The period of the sine or cosine function is affected by the coefficient B in $A\sin(B\theta)$ or $A\cos(B\theta)$, with period $\frac{2\pi}{|B|}$ ().

Problem-Solving Strategies

- Use definitions and the Pythagorean theorem to find coordinates on the circle.
- Pay attention to the quadrant to determine the correct signs.
- When solving for angles, choose convenient points on the circle to simplify calculations.
- Always double-check signs and data consistency to avoid mistakes.
- Practice converting between function forms and graphs, including transformations like stretching, compressing, and shifting ().

Study Tips

- Memorize key trig identities and definitions.
- Practice drawing angles in standard position and finding their coordinates.
- Understand how transformations affect graphs (amplitude, period, midline).
- Use the Pythagorean theorem and ratios to find missing sides or angles.
- Rationalize denominators when necessary, but recognize cases where it is impossible (irrational denominators like π or e) ().

Note: Focus on understanding the concepts and practicing problem-solving techniques rather than rote memorization alone.

Transformations of Trigonometric Functions

- **Coefficients in the input**: Multiplying the variable inside the function, such as in $\sin(3x)$, affects the period. Specifically, the coefficient b in $y = \sin(bx)$ compresses or stretches the graph horizontally.
    - If $b > 1$, the graph compresses by a factor of $\frac{1}{b}$. For example, $\sin(3x)$ has a period of $\frac{2\pi}{3}$ because the normal period 2π is divided by 3 ().
    - If $0 < b < 1$, the graph stretches horizontally by a factor of $\frac{1}{b}$.
- **Effect of coefficients**: The coefficient on x determines the period length:

$$\text{Period} = \frac{2\pi}{|b|}$$

  (e.g., for $y = \sin(2x)$, period = π) ().

- **Vertical transformations**:
    - **Amplitude**: The coefficient a in $y = a\sin(x)$ affects the height of the wave. The range becomes $[-|a|, |a|]$ ().
    - **Vertical stretch/compression**: Multiplying the entire function by a stretches or compresses vertically.
- **Phase shifts (horizontal translations)**:
    - The term c in $y = \sin(x - c)$ shifts the graph horizontally.
    - If $c > 0$, the graph shifts to the right; if $c < 0$, it shifts to the left ().
- **Vertical translations**:
    - The constant d in $y = \sin(x) + d$ shifts the graph vertically upward if $d > 0$, downward if $d < 0$ ().
- **Reflections**:
    - A negative coefficient, such as in $y = -\sin(x)$, reflects the graph over the x-axis ().
- **Order of transformations**:
    - The sequence matters. Typically, the order is: reflect, stretch/compress, then translate. For example, the negative and the coefficient b (stretch/compression) are applied first, followed by translations ().
- **Graphing instructions**:

- When graphing over a specific domain (e.g., -2π to 2π), ensure the entire period is captured.
- Use open or closed circles to indicate points at domain boundaries, and avoid arrows if the domain is finite ().

- **Identifying key features**:
  - **Range**: Determined by amplitude and vertical shift.
  - **Period**: Calculated from the coefficient b.
  - **Amplitude**: Absolute value of a.
  - **Phase shift**: Based on c.

- **Additional notes**:
  - Horizontal compression or stretch is always by a factor of $\frac{1}{|b|}$.
  - Reflection over the x-axis occurs with a negative coefficient.
  - Vertical shifts move the entire graph up or down.
  - The order of transformations affects the final graph, so it's important to apply them in the correct sequence.

This summary references key concepts from the excerpts, such as the effects of coefficients on period (), the effect of vertical shifts (), and the importance of transformation order ().