The first test will cover Chapter P sections 1–5 and Chapter 1 sections 1–4. This is not meant to be an exhaustive list of problems that will be on the test, but rather a sample of things to expect.

1. Preliminaries

Be able to find slopes and equations of straight lines. Know the definition of even and odd functions and how to test for them. Be able to graph functions with shifts and stretches. Know the definition of an inverse function and when a function has an inverse. Know the definition of exponential and logarithmic functions, and the definition of the trigonometric functions and their inverses.

Describe in complete sentences:

1.1 The definition of even and odd functions
1.2 The definition of a one-to-one function
1.3 The definition of the inverse of a function
1.4 When a function has an inverse

Are the following functions odd, even or neither?

1.5 \( f(x) = \frac{1}{\sqrt{x^2+1}} \)
1.6 \( f(x) = \frac{x+1}{\sqrt{x^2+1}} \)
1.7 \( f(x) = \frac{x}{\sqrt{x^2+1}} \)
1.8 \( f(x) = \sin x \)
1.9 \( f(x) = \cot x \)

1.10 Find the inverse of \( f(x) = \frac{5x - 1}{3x + 2} \) and write down the domain and range of both \( f \) and \( f^{-1} \).

1.11 Graph the function \( y = 2\cos(x + \pi/4) + 1 \).

1.12 Find (a) \( \cos(3\pi/4) \), (b) \( \sin(11\pi/6) \) and (c) \( \cot(4\pi/3) \).

1.13 State the domain and range of \( \cos^{-1} x \) and graph \( y = \cos^{-1} x \).

1.14 Simplify \( \frac{\ln(44) + \ln(1/11)}{\ln 8} \).
2. Limits

Know how to calculate limits of all forms. If a limit does not exist, then say why. If the value of a limit approaches plus or minus infinity, then say so; to say a limit equals infinity is wrong. Be able to apply the sandwich theorem to calculate limits.

For each exercise find the limit or explain why it doesn’t exist:

2.1 \( \lim_{x \to 0} \frac{x^2 - 4x + 4}{x^3 + 5x^2 - 14x} \) (a) as \( x \to 0 \), (b) as \( x \to 2 \), (c) as \( x \to \infty \), (d) as \( x \to -\infty \).

2.2 \( \lim_{x \to 1} \frac{1 - \sqrt{x}}{1 - x} \) (a) as \( x \to 1 \) and (b) as \( x \to \infty \).

2.3 \( \lim_{h \to 0} \frac{(x+h)^2 - 1}{h} \).

2.4 \( \lim_{x \to -\infty} \frac{3x^3 - 2x^2 + 5}{2x^3 - x^2 + 17} \).

3. Continuity

Know the definition of continuity and how to apply it to determine if a given function is continuous. Know and use the Intermediate Value Theorem for continuous functions.

3.1 What is the definition of a continuous function?

Determine whether the function is continuous at the given point:

3.2 \( f(x) = |x| \) at \( x = 0 \)

3.3 \( \sin(x - \sin x) \) at \( x = \pi \)

3.4 \( \tan \left( \frac{\pi}{4} \cos(\sin x^{1/3}) \right) \) at \( x = 0 \).

On what intervals are the following functions continuous?

3.4 \( y = \frac{1}{x - 2} - 3x \)

3.5 \( y = \sqrt{2x + 3} \)

3.6 \( y = \tan \frac{\pi x}{2} \)

3.7 \( y = \sqrt{4x^2 - 9} \)

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