Math 7B Final Exam Potential Questions 2025

Algebra!

1. Simplify: $\frac{6a^3(b^2c^8)^2}{3^3 2^{-1}(abc)^5}$
2. Expand as sums of powers of g: $(3g + 5)^4$
3. Using algebraic identities, calculate: $67^3 - 66^3$
4. Factor $29x^2 + 181x + 42$

Arithmetic Sequence

5. Timmy is a sequence whose third term (a_3) is 16 and whose 17th term (a_{17}) is 114. Find the first term a_1 and common difference d.
6. Find the sum of the first 3500 even numbers.

Geometric sequence

7. Write the first 7 terms of a geometric progression with $a_1 = 24$ and $q = \frac{1}{3}$
8. What is the total sum of an infinite sequence whose first several terms are: $21, \frac{63}{4}, \frac{189}{16}, \ldots$

Combinatorics

9. Lea desperately needs to finish her homework. She has 7 assignments to do in total: English, History, and five Math assignments. How many different orders are there in which to do her homework (assume that all the math assignments are different)?
10. Oh no! Lea has gotten herself into another pickle. Now, out of the 9 math assignments she has to do, she only has time for 5. How many different ways are there to choose which of the five assignments to do, with no regard to the order in which Lea does them?

Quadratic Equations and inequality

11. Solve using the quadratic formula: $\frac{x}{x-4} = x + 3$
12. Solve the following inequality: (a) $x - \frac{3}{x} = \frac{5}{x} - x$ (b) $\frac{(x+1)}{(x-1)} = 3$

Vieta's Formulas

13. Without solving the equation $4x^2 + 6x - 7 = 0$, find the value of $x_1 + x_2$ and x_1x_2 given that x_1 and x_2 are solutions to the equation.
14. Solve the equation $(x^2 + 7)^2 + 5x^2 + 6 = 0$. Hint: try creating a new variable t, such that $t = x^2 + 7$. Then, rewrite the equation above into a quadratic function of t.

Polynomial Inequalities

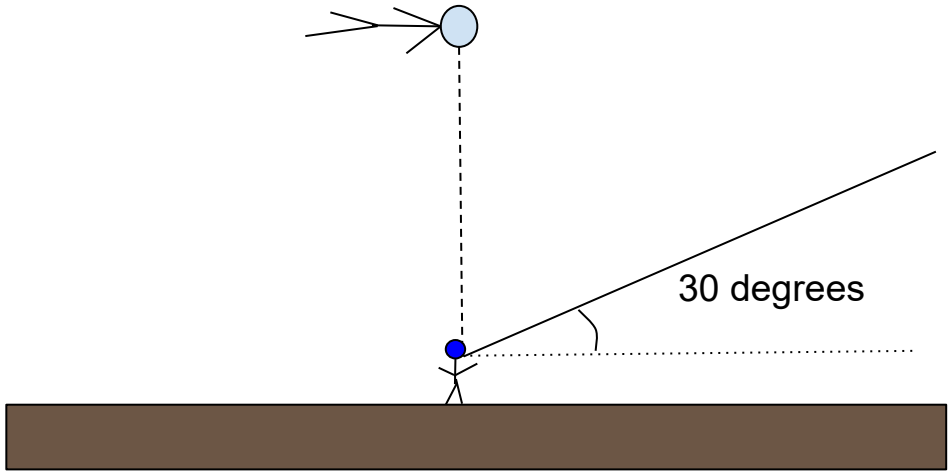
15. Solve the following inequality using any method you prefer: $x(x^2 - 4)(x + 7)^4 < 0$

Coordinate Geometry

16. Judy is training for a track event. Her cross-country path is a straight line in which she passes the points A (1, 20) and B (3, 28). Find the equation of this path, as well as the distance between points A and B.
17. At the same time, Craig is working on sprints along a trajectory. His path takes him along the equation $y = 2x^2$. At which point(s) will Craig's path intersect with Judy's?
18. Find intersection points of a circle $x^2 + (y-2)^2 = 5$ and line $y = -\frac{x}{2} + 2$.

Trigonometry

19. Jeffrey's brother, Jerethon, has a dilemma. He needs to get to a friend's house on the other side of town, but Google Maps is only showing him the path along some weird and inefficient road! Fortunately, Jerethon can fly. If the path tells him to go 2 miles S, 1 mile W, and 4 miles SE, and 1.5 mi N, what is the actual x- and y- distance that Jerethon has to travel? And how long would it take him to fly along a straight line from his current location to his friend's house if he can fly at 5 mi/hr? (Note: SE is the direction that bisects the angle between South and East)
20. As Jerethon flies, he sees another friend of his on the ground below him. If Jerethon is flying at an altitude of 200 meters above friend's head, and his friend is only paying attention to what is happening at an altitude of 30 degrees from his line of sight, how far would Jerethon have to fly horizontally to be noticed by his friend? (diagram provided)



Trigonometric Equations

21. Which is larger: $cos(\frac{2\pi}{7})$ or $cos(30°)$? (first angle measurement is in radians, second one is in degrees)
22. Solve the following equality: $4\ cos(x) + \frac{3}{\cos(x)} = 8$.

23. Solve the following inequality: $sin(x) < 0, cos(x) < -\frac{\sqrt{3}}{2}$