

Math 4982 - Senior Seminar College Algebra Review Questions

1. Evaluate $5 \times 5 - 1 \times 4 + 2 \div 4 + 1$.
2. Compute the product $(2h^2 - 3h + 8)(3h - 1)$.
3. Write the following as a single rational expression:

$$\frac{m+2}{m^2-25} - \frac{m+6}{m^2-10m+25}$$

4. If $A = (-1, 4]$ and $B = [3, 7)$, compute the following:

- (a) $A \cap B$
- (b) $A \cup B$

5. Solve the following inequality, expression your solution in interval notation:

$$2 < \left| -3m + \frac{4}{5} \right| - \frac{1}{5}$$

6. Simplify i^{2011} .
7. Write $\frac{3-i}{2+i}$ in standard $a + bi$ form.
8. How many x -intercepts does the function $f(x) = x^3 - 4x^2 + 7x$ have?
9. Solve for the variable x in the equation $x - 3\sqrt{x+4} + 4 = 0$.

10. Compute the domain of each of the following functions:

- (a) $f(x) = \frac{2}{x^2 - 4}$
- (b) $g(x) = \sqrt{4x + 1}$
- (c) $(f + g)(x)$
- (d) $\frac{f(x)}{g(x)}$

11. Sketch the graph of one function which satisfies all of the following criteria.

- (a) Domain is $(-4, 4]$
- (b) $f(x)$ is continuous everywhere in the domain except at $x = 0$.
- (c) $f(x)$ has a jump discontinuity at $x = 0$.
- (d) $f(0) = 2$
- (e) $f(x)$ is increasing on $(-4, -1) \cup (2, 4]$.
- (f) $f(x)$ is constant on $(-1, 0)$.
- (g) $f(x)$ is decreasing on $(0, 2)$.

12. Sketch the graph of $f(x) = x^3(x-1)^2(x+2)(x-4)^3(x+4)^4$

13. Consider the function $f(x) = \frac{2x - x^2}{x^2 + 4x - 5}$

- (a) Find the domain of $f(x)$.
- (b) Find the roots of $f(x)$.
- (c) Locate any and all horizontal, vertical and slant asymptotes.

(d) Graph $f(x)$ with the help of parts (a)–(c).

14. State the possible rational roots of $p(x) = x^3 - 4x^2 - 7x + 10$, and then factor $p(x)$ fully.

15. Write an equation corresponding to the following sentence:

A student's final grade varies jointly with quiz scores, hw grades and final exams, and inversely with the square of the number of absences.

16. Sketch the graph of $f(x) = e^{-x} + 1$.

17. Solve for x in the equation $4 = 3^{-x+4} + 2$.

18. Solve for x in the equation $\log_3(x - 4) - \log_3(7) = 2$.

19. Sketch the graph of $f(x) = \ln(x + 1) - 2$.

20. Solve the following system of linear equations:

$$\begin{cases} 3x - 2y + z = -1 \\ 2x + y - z = 5 \\ 10x - 2y = 8 \end{cases}$$

21. Convert the system from problem 20 to matrix form $AX = B$. You do not have to solve the system again.

22. Solve the following system of nonlinear equations:

$$\begin{cases} -x + y = 4 \\ x^2 + y^2 = 16 \end{cases}$$

23. Solve the following system of nonlinear inequalities:

$$\begin{cases} -x + y \leq 4 \\ x^2 + y^2 \leq 16 \end{cases}$$

24. Given A and B below, compute both AB and BA .

$$A = \begin{bmatrix} 2 & -1 \\ 1 & 2 \\ 3 & 0 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & -2 & 3 \\ 1 & 0 & 2 \end{bmatrix}$$

25. Only one of the following two matrices is invertible. Which one, and why?

$$A = \begin{bmatrix} 4 & -7 \\ 3 & -5 \end{bmatrix}, \quad B = \begin{bmatrix} -2 & 6 \\ -3 & 9 \end{bmatrix}$$