These are some review questions for the Final Exam. If you can successfully complete these TYPES of questions, you should be well prepared for the exam. I also suggest you thoroughly read the review guide for information about what material I have specifically excluded or included.

Exam 1 material

Appendix A

1. Simplify and rewrite each expression with only positive exponents
   (a) $\left(\frac{2x^{-4}y^3}{y^2z^{-4}}\right)^2$
   (b) $\frac{x^{-1/2}y^{2/3}}{(xy)^{2/3}}$
2. Solve the following equations
   (a) $2x + x^2 - 8 = 0$
   (b) $x^2 + 64 = 0$
   (c) $x^2 - 81 = 0$

Chapter 1

3. Consider $(5, -10)$ and $(-1, 8)$
   (a) Find the distance between the points.
   (b) Find the midpoint of the line segment joining the points.
4. Use algebraic tests to check $x = y^2 - 8$ for symmetry with respect to both axes and the origin. Then sketch the graph of the equation.
5. Find the center and the radius of the circle $(x + 3)^2 + (y - 5)^2 = 36$.
6. Write the standard form of the equation of the circle with center $(-2, 0)$ and radius 4.
7. Find the slope of the line through the points $(2, -8)$ and $(0, 9)$.
8. Write an equation of the line that passes through $(6, -2)$ with slope $m = -\frac{1}{3}$. Write your answer in both point-slope form and slope-interecept form.
9. Write the equation of the line (in slope-intercept form) that passes through the point $(-1, 2)$ and is
   (a) parallel to $2x - 3y = 9$
   (b) perpendicular to $2x - 3y = 9$
10. Evaluate $f(x) = x^2 + 3x + 2$ at

(a) $f(2)$

(b) $f(t^2)$

(c) $f(t+1)$

11. If $f(x) = \begin{cases} 125 & if\ x < 0 \\ 8x+2 & if\ 0 \le x \le 1 \\ 6-x^2 & if\ 1 < x \end{cases}$ find:

(a) $f(-20)$

(b) $f(1)$

(c) $f(6)$

12. Find the domain of

(a) $f(x) = \sqrt{8x-15}$

(b) $h(x) = \frac{3x+13}{x^2-3x+18}$

13. Determine whether the function $f(x) = -3x\sqrt{x^2+10}$ is even, odd, or neither.

14. Graph the following:

(a) $h(x) = x^3 + 5$

(b) $f(x) = \sqrt{x-4}$

(c) $f(x) = \begin{cases} 3x+7 & if\ x \le -3 \\ 4x^2-1 & if\ x > -3 \end{cases}$

15. Consider h(x) below. For each h, identify the parent function f and describe the sequence of transformations from f to h. Then graph h.

(a) $h(x) = -\sqrt{x+1} + 9$

(b) $h(x) = -(x+3)^2 + 1$

16. For $f(x) = 3x^2 - 7$ and $g(x) = -x^2 - 4x + 5$ calculate the following:

(a) $(f+g)(x)$

(b) $(f-g)(x)$

(c) $(fg)(x)$

(d) $\left(\frac{g}{f}\right)(x)$

(e) $(f \circ g)(x)$

(f) $(g \circ f)(x)$

17. Repeat the previous question for $f(x) = \frac{1}{x}$ and $g(x) = 2\sqrt{x}$.

18. Find the inverse of $f(x) = \frac{2}{2x-3}$

Exam 2 material

Chapter 2

1. Consider the function $y = -x^2 + 4x + 5$
   (a) Does the parabola open up or down? Is the vertex a min or max?
   (b) Find the coordinates of the vertex. Write the answer as an ordered pair.
   (c) Find the y-intercept. Write the answer as an ordered pair.
   (d) Find the x-intercepts, if any exist. Write the answer(s) as an ordered pair(s).
   (e) Using the above answers graph the function.
2. Find all the real zeros of the polynomial $f(x) = 2x^3 + 9x^2 + 11x$. Determine the multiplicity of each zero and the number of turning points of the graph of the function.
3. Use long division to divide $\frac{4x^3-8x^2+x+3}{2x-3}$
4. Verify that $(x-4)$ and $(x+2)$ are factors of $f(x) = 8x^4 - 14x^3 - 71x^2 - 10x + 24$ and find the remaining factors of $f(x)$. Write the complete factorization of $f(x)$ and list all zeros.
5. Perform the operations and write the result in standard form.
   (a) $(20 - 2i) - (6 + 4i)$
   (b) $(10 - 3i)(4 + 12i)$
6. Write the quotient $\frac{-5+3i}{1+7i}$ in standard form.
7. List all possible rational zeros of $f(x) = 2x^4 - 15x^3 + 23x^2 + 15x - 25$.
8. Find a polynomial function with real coefficients that has zeros: 1, -4, $2 + 3i$.
9. Use the zero $5 - 2i$ to find all the zeros of $f(x) = x^3 - 7x^2 - x + 87$.
10. Use the rational zero test to find all zeros of the function $f(x) = x^3 + 9x^2 + 27x + 35$.
11. Consider $h(x) = \frac{x^2}{3x+1}$
    (a) State the domain of the function
    (b) Identify all intercepts
    (c) Find any vertical and horizontal or slant asymptotes
    (d) Plot some additional solution points as needed
    (e) Sketch the graph of $f(x)$
12. Repeat the above question for $f(x) = \frac{x^2-2x-8}{x^2-9}$

Chapter 3

13. Use the One-to-One property to solve
    (a) $e^{4x} = e^{x^2+3}$
    (b) $\ln(6x - 13) = \ln 34$
14. (a) Write $5^{-2} = \frac{1}{25}$ in logarithmic form.
    (b) Write $\log_4 4096 = 6$ in exponential form.
15. Use properties of logarithms to expand $\ln\left(\frac{\sqrt{x}y^4}{z^4}\right)$ as multiple logarithms.
16. Use properties of logarithms to condense $4[\ln z + \ln(z + 5)] - 2\ln(z - 5)$ into a single logarithm.
17. Solve the following equations algebraically.
    (a) $\log x - \log(8 - 5x) = 2$ (You must consider the domain)
    (b) $8(3^{6-x}) + 3 = 43$
18. Use the exponential decay model $y = ae^{-bt}$ (see page 260) to answer the following question about radioactive isotopes. If we initially have 10 grams of ^{226}Ra isotope with a half-life of 1599 years, how much is left after 250 years? (Hint: you must find the inital model equation first).

Exam 3 material

Chapter 7

1. Use substitution to solve $\begin{cases} x - y = 10 \\ x - y^2 = 10 \end{cases}$
2. Use elimination (without matrices) to solve $\begin{cases} 4x + 2y = 12 \\ 5x - 3y = -5 \end{cases}$
3. Use Gaussian elimination (without matrices) to solve $\begin{cases} x - 2y + z = -6 \\ 2x - 3y = -7 \\ -x + 3y - 3z = 11 \end{cases}$
4. Solve the following system of equations using Gaussian Elimination AND Gauss-Jordan Elimination (both with matrices). $\begin{cases} -3x + y + 7z = -20 \\ 5x - 2y - z = 34 \\ -x + y + 4z = -8 \end{cases}$

5. Use the following matrices to perform the indicated matrix operations, if possible. Show your work or explain why the operation cannot be performed.

$$A = \begin{bmatrix} -4 & 3 & 8 \\ 1 & 0 & -3 \\ 6 & 2 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 4 \\ 1 & -3 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 4 \\ 0 & 3 \\ 6 & -2 \\ -3 & 7 \end{bmatrix} \quad D = \begin{bmatrix} 2 & 0 & 8 \\ -1 & 3 & 10 \\ -4 & 1 & 2 \end{bmatrix}$$

   (a) $A + 4D =$
   (b) $AD =$
   (c) $AB =$
   (d) $CB =$

6. Consider $A = \begin{bmatrix} 9 & -3 \\ 4 & 7 \end{bmatrix}$
   (a) Find the inverse of A using the formula for a 2 x 2 matrix.
   (b) Find the inverse of A using the augmented matrix procedure.

7. Use the augmented matrix procedure to find the inverse of $A = \begin{bmatrix} -1 & 0 & 12 \\ 4 & -2 & 6 \\ -3 & 1 & -7 \end{bmatrix}$

8. Use inverse matrices to solve $\begin{cases} 3x - 4y = 12 \\ -x + 3y = 8 \end{cases}$

9. Find the determinant of $A = \begin{bmatrix} 4 & 0 & -1 \\ 8 & -1 & 0 \\ 0 & 3 & -2 \end{bmatrix}$

Chapter 9

10. Find the first 5 terms of the sequence $a_n = n(n^2 - 12)$

11. Determine whether the sequence $a_n = -\frac{3}{4}n + 8$ is arithmetic. Find the first 5 terms.

12. Find a formula for a_n for the arithmetic sequence with $a_1 = -3$ and $d = -2$.

13. Find the partial sum $\sum_{n=1}^{65} 4n$

14. Find the sum of the finite geometric sequence $\sum_{n=1}^{25} \left(\frac{1}{7}\right)^{n-1}$

15. Find the sum of the infinite geometric sequence $\sum_{n=0}^{\infty} 4\left(\frac{2}{9}\right)^{n}$

16. Use the Binomial Theorem to expand and simplify $(x + y)^5$