#1) Suppose $f(x) = 2x+3$ and $g(x) = x^2+1$

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

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

#2) Simplify the following

(a) $\left(\sqrt[n]{x}\right)^n$

(b) $\sqrt[n]{x^n}$

(c) $3^{\log_3(x)}$

(d) $\log_e(e^x)$

(e) $\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}^{-1} \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$

#3) Suppose $f(2) = 3$, and $f(1) = 4$.
Suppose f has an inverse function f^{-1} and that $f^{-1}(7) = 5$ and $f^{-1}(11) = -3$. Find the following:

(a) $f(5)$

(b) $f^{-1}(3)$

(c) $f^{-1}(4)$

(d) $f(-3)$

#4) Find the inverse function of $f(x) = 2x - 3$.

#5) Simplify

(a) $27^{1/3}$

(b) $16^{-1/4}$

(c) $\left(\frac{1}{4}\right)^{-3}$

#6) Write the following rational function as a polynomial: $\frac{3x^3 - 4x^2 - 5x + 2}{x - 2}$

#7) Find the roots of the following polynomials:

(a) $-3x + 7$

(b) $-3x^2 - 2$

(c) $-3x^2 + 4x + 2$

(d) $2x^2 - 12x + 18$

(e) $3x^3 - 39x + 36$

#8) Solve for x

(a) $173^{(4x+2)}\,173^{(3x-1)} = 1$

(b) $\log_e(3) + \log_e(4x) = 3$

(c) $\sqrt[3]{2x}\,\sqrt[3]{x} = 2$

(d) $e^{2x}\,e^{3x} = 3$

(e) $\log_2(x) + \log_2(15) = 4$

#9) Find the determinants of the following matrices

(a) $\begin{pmatrix} 4 & 2 \\ 11 & 6 \end{pmatrix}$

(b) $\begin{pmatrix} 12 & 3 \\ 8 & 2 \end{pmatrix}$

(c) $\begin{pmatrix} -4 & 3 \\ 2 & 5 \end{pmatrix}$

#10) Write the following systems of linear equations as equations of matrices.

(a)
$$\begin{cases} 3x - 4y = 2 \\ x + y + z = -3 \\ -7x + 2y - 3z = 7 \end{cases}$$

(b)
$$\begin{cases} 3y + 5z = 0 \\ -x - y + 7z = -1 \\ 3x - 2y - z = 1 \end{cases}$$

#11) Solve for x, y, z.

(a)
$$\begin{pmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ 6 & -2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2 \\ 5 \\ 7 \end{pmatrix}$$

Hint:
$$\begin{pmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ 6 & -2 & -3 \end{pmatrix}^{-1} = \begin{pmatrix} -2 & -3 & 1 \\ -3 & -3 & 1 \\ -2 & -4 & 1 \end{pmatrix}$$

(b) $\begin{pmatrix} 6 & 4 & 1 \\ 7 & 6 & 4 \\ -1 & -1 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -3 \\ 4 \\ 0 \end{pmatrix}$

Hint: $\begin{pmatrix} 6 & 4 & 1 \\ 7 & 6 & 4 \\ -1 & -1 & -1 \end{pmatrix}^{-1} = \begin{pmatrix} 2 & -3 & -10 \\ -3 & 5 & 17 \\ 1 & -2 & -8 \end{pmatrix}$

#12) Multiply the following matrices

(a) $\begin{pmatrix} 3 & 2 \\ 2 & 4 \end{pmatrix}\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

(b) $\begin{pmatrix} 3 & 7 & 1 \\ 2 & -3 & -4 \\ 1 & -10 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$

(c) $\begin{pmatrix} 6 & 3 \\ 2 & 0 \end{pmatrix}\begin{pmatrix} 0 & 1 \\ 1 & 3 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 7 & -4 & -1 \end{pmatrix}\begin{pmatrix} 1 & 3 & -1 \\ 0 & 2 & 3 \\ 0 & 0 & -1 \end{pmatrix}$

#13) For each of the following sequences, write A if it is arithmetic, G if it is geometric, and N if it is neither.

(a) 2, 9, 16, 23, ...

(b) 5, 25, 125, 625, ...

(c) -4, 12, -36, 108, ...

(d) 7, 10, 20, -5, ...

(e) -8, 10, 28, 46, ...

#14) Find the [redacted] sums of the following sequences

(a) 16, 4, 1, $\frac{1}{4}$, ...

(c) $-200, -\frac{400}{3}, -\frac{800}{9}, -\frac{1600}{27}, \ldots$

#15) There are 138 hats in a closet. You have room in your suitcase for only 5. How many different collections of 5 hats can you take on vacation?

#16) You have 38 books on a bookshelf. The books fall off the shelf. How many different ways can you arrange the 38 books from right to left on the shelf?

#17) You have 19 ingredients for cooking. Suppose that if you use an ingredient, you have to use it in its entirety.

You want to use exactly 7 ingredients to make dinner. How many options for dinner do you have?

#18) 17 clowns decide to exit a car. They need to decide who leaves first, second, third, etc. because the door is small and they have to leave one at a time.

How many possible ways can the clowns exit the car?

#19) You want to watch 37 hours of uninterrupted television. Each hour, you will watch a single channel. You'll never watch more than one hour of each channel. If you have 96 channels to choose from, how many ways can you carry out your T.V. watching marathon?

#20) What is the Binomial Theorem?

#21) What are the implied domains of the following functions?

(a) $\log_{15}(5x-3)$

(b) $\sqrt[3]{x^2-7}$

(c) $\dfrac{e^{5x^2-1}}{x-2}$

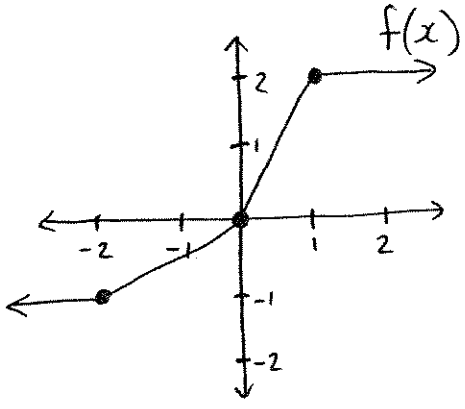
(d) $\sqrt[2]{5x-3}$

(e) $\dfrac{x^2-17x+2}{2^{3x-1}}$

#22) The graph of $f(x)$ is given.

(a) graph $2f(x-1)$

(b) graph $f(-x)-1$



#23) Graph the following functions.

(•) x

(•) x^2

(•) x^3

(•) $\sqrt[2]{x}$

(•) $\sqrt[3]{x}$

(•) e^x

(•) $\log_e(x)$

(•) $1/x$

(•) $1/x^2$

(•) $3(x-2)(x-1)(x+1)(x+2)$

(•) $-2(x-2)(x-2)(x-4)(x-4)(x-5)$