1) Find the values of constants A and B so that $\dfrac{6}{3n+4 \quad 3n-1} = \dfrac{A}{3n+4} + \dfrac{B}{3n-1}$.

2) Find the domain for each of the following functions. State your answers in interval notation.

a. $y = \sqrt{\dfrac{x^2+x-2}{x^2-x-20}}$ b. $y = \log \ x^3 - 3x^2$

3) Simplify. Show your reasoning.

a. $\tan\theta \cdot \cot\theta - \cos^2\theta$ b. $\csc x - \cot x - \dfrac{\sin x}{1+\cos x}$

4) Solve the equation for x in the indicated domain:

$$4\sin^2(x) + 6\csc^2(x) = 11, \quad 0 \le x < 2\pi$$

5) Let $a_n = \left(\dfrac{1}{2} i\right)^n$, where $i = \sqrt{-1}$, the imaginary unit. You will want to use your calculator for this question.

a) State the first 8 terns of a_n exactly.

b) State the first 6 terms of S_n where $S_n = \sum_{i=1}^{n} a_n$.

c) Using the $\sum$ key on your calculator, give a twelve decimal approximation for $\sum_{k=1}^{20}\left(\dfrac{1}{2}i\right)^k$, $\sum_{k=1}^{200}\left(\dfrac{1}{2}i\right)^k$, and $\sum_{k=1}^{1000}\left(\dfrac{1}{2}i\right)^k$.

6) In ΔABC, $b = \sqrt{5}$, $c = \sqrt{17}$ and $\cos B = \dfrac{4}{\sqrt{17}}$. Find the exact value of a.

7) Let $f(x) = 3x^2 + 2x - 5$. Simplify: $\dfrac{f(x+h) - f(x-h)}{2h}$.

8) Find all values of x for which the geometric series $S = 1 + 2(x-3) + 4(x-3)^2 + 8(x-3)^3 + \ldots$ converges. Then, assuming these values for x, find S in terms of x as a simple fraction.

9) Find the sum of all multiples of 12 between 100 and 1000.

10) State the expanded form of $\sum_{i=0}^{n}\binom{n}{i}$ and give its sum. You will want to use '. . . ' in your expansion.

11) On his daughter's first birthday, Dr. Condie deposits \$ 1,000 into an account that pays 6.8% compounded annually. Each succeeding birthday he deposits another \$ 1,000.

a. Using $\sum$ notation, write an expression for the amount in the account on her 18th birthday after his deposit.
b. Determine the total amount in the account on that day.
c. How much must he deposit each year for the account to be worth \$ 100,000 by her 18th birthday?

12) Find, to the nearest hundredth of a degree, the angle formed by the two "main" diagonals of a cube.

13) Consider the sequence: $\begin{cases} a_1 = 1 \\ a_2 = 1 \\ a_n = 5a_{n-2} + 2a_{n-1} \end{cases}$

a) State the first 8 terms of the sequence.

b) Let $G_n = \dfrac{a_{n+1}}{a_n}$. Find G_5.

c) Give a five decimal appproximation of $\lim_{n\to\infty} G_n$.

14) Evaluate the following extended fraction: $2+\cfrac{5}{2+\cfrac{5}{2+\cfrac{5}{2+\cfrac{5}{\cdots}}}}$.

State your answer exactly and as a five decimal approximation.

15) Consider the sequence: $\begin{cases} a_1 = 5 \\ a_2 = 3 \\ a_n = 5a_{n-2} + 2a_{n-1} \end{cases}$

a) State the first 8 terms of the sequence.

b) Let $G_n = \dfrac{a_{n+1}}{a_n}$. Find G_5. State your answer to five decimal places.

c) Give a five decimal appproximation of $\lim_{n\to\infty} G_n$.

d) State the exact value of $\lim_{n\to\infty} G_n$.

16) Consider the sequence: $\begin{cases} a_1 = 4 \\ a_2 = 6 \\ a_n = 3a_{n-2} + 7a_{n-1} \end{cases}$

a) Let $G_n = \dfrac{a_{n+1}}{a_n}$. State an extended fraction that equals the exact value of $\lim\limits_{n\to\infty} G_n$.

b) Find the exact value of $\lim\limits_{n\to\infty} G_n$.

17) Write the first 10 terms as reduced fractions of the sequence given by:

$$1,\ 1+1,\ 1+\frac{1}{1+1},\ 1+\frac{1}{1+\frac{1}{1+1}},\ 1+\frac{1}{1+\frac{1}{1+\frac{1}{1+1}}},\ \ldots$$

18) A Ferris wheel with a diameter of 20 m rotates at a rate of 2 minutes per revolution. Riders board the Ferris wheel 1 m above the ground at the bottom of the wheel. A couple boards the Ferris wheel and the ride starts.

a. How far above the ground is the couple 40 seconds after the ride starts?

b. How many seconds will it be (after the ride starts) before the couple is 10 m above the ground for the *second time*?