1) **Section 9.1** (6 points) Write the series represented by the summation notation given below. Then evaluate the sum.

$$\sum_{n=2}^{6} \frac{3n}{2(n-1)}$$

$$\sum_{n=2}^{6} \frac{3n}{2(n-1)}$$

$$= \frac{6}{2(1)} + \frac{9}{2(2)} + \frac{12}{2(3)} + \frac{15}{2(4)} + \frac{18}{2(5)}$$

$$= 3 + \frac{9}{4} + 2 + \frac{15}{8} + \frac{9}{5}$$

$$= \frac{120 + 90 + 80 + 75 + 72}{40}$$

$$= \frac{437}{40}$$

2) **Section 9.2** (5 points) Find the 12th term of the arithmetic sequence if the eighth term is 12 and the 23rd term is 50.

$$a_{23} = a_8 + 15d$$

$$50 = 12 + 15d$$

$$38 = 15d$$

$$d = \frac{38}{15}$$

$$a_{12} = a_8 + 4d$$

$$a_{12} = 12 + 4\left(\frac{38}{15}\right)$$

$$= 12 + \frac{152}{15}$$

$$= \frac{180}{15} + \frac{152}{15}$$

$$\boxed{a_{12} = \frac{332}{15}}$$

3) **Section 9.4** (5 points) Find the sum of the first 25 terms of the arithemetic sequence given below.

$$3, 7, 11, 15, \ldots$$

$$\underbrace{3 + 7 + 11 + 15 + \cdots + a_{25}}_{\text{25 TERMS}}$$

$$\text{SUM} = \frac{n(a_1 + a_n)}{2}$$

$$a_{25} = a_1 + 24d$$
$$3 + 24(4)$$
$$= 3 + 96$$
$$= 99$$

$$\text{SUM} = \frac{25(3 + 99)}{2}$$
$$= \frac{25(102)}{2}$$
$$= 25(51)$$
$$\boxed{= 1275}$$

4) **Section 9.4** (5 points) Find the sum of the arithmetic series given below.

$$\frac{1}{3} + \frac{2}{3} + 1 + \frac{4}{3} + \cdots + 22$$

$$\text{Sum} = \frac{n(a_1 + a_n)}{2} = \frac{n\left(\frac{1}{3} + 22\right)}{2}$$

$$a_n = a_1 + (n-1)d$$

$$22 = \frac{1}{3} + (n-1)\left(\frac{1}{3}\right)$$

$$22 = \cancel{\frac{1}{3}} + \frac{1}{3}n - \cancel{\frac{1}{3}}$$

$$22 = \frac{1}{3}n$$

$$n = 66$$

$$= \frac{66\left(\frac{1}{3} + 22\right)}{2}$$

$$= 33\left(\frac{67}{3}\right)$$

$$= 11(67)$$

$$= 737$$

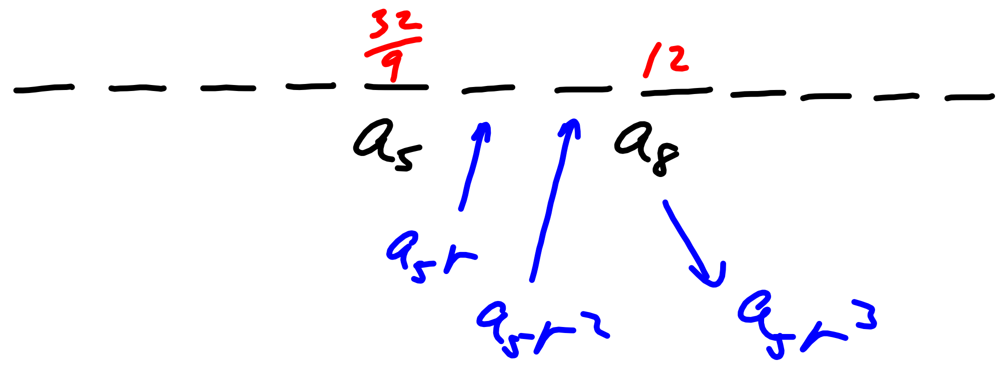
5) **Section 9.1/9.4** (5 points) Find the sum of the first 5 terms of the recursive sequence given by $a_n = 2a_{n-1} + 3$ with $a_1 = -2$.

$-2, -1, 1, 5, 13$

$-2 + (-1) + 1 + 5 + 13$

$= 16$

6) **Section 9.3** (5 points) Find the 12th term of the geometric sequence if the eighth term is 12 and the fifth term is $\frac{32}{9}$.



$$a_8 = a_5 r^3$$

$$12 = \frac{32}{9} r^3$$

$$r^3 = 12\left(\frac{9}{32}\right) = 3\left(\frac{9}{8}\right) = \frac{27}{8}$$

$$r^3 = \frac{27}{8}$$

$$r = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$$

$$a_{12} = a_8 r^4 = 12\left(\frac{3}{2}\right)^4$$

$$= 12\left(\frac{81}{16}\right) = 3\left(\frac{81}{4}\right)$$

$$a_{12} = \frac{243}{4}$$

7) **Section 9.5** (5 points) Evaluate the sum of the finite Geometric Series given below.

$$\sum_{n=1}^{6} 3(4)^{n-1}$$

$$\text{Sum} = \frac{a_1(1-r^n)}{1-r}$$

$$= \frac{3(1-4^6)}{1-4}$$

$$= -(1-4^6)$$

$$= 4^6 - 1$$

$$= 4095$$

8) **Section 9.5** (5 points) Find the sum of the infinite Geometric Series given below.

$$\sum_{n=1}^{\infty} -\frac{1}{6}\left(-\frac{1}{2}\right)^{n-1}$$

This series may also be represented as

$$-\frac{1}{6}+\frac{1}{12}-\frac{1}{24}+\frac{1}{48}-\frac{1}{96}+\cdots$$

$$\text{Sum} = \frac{a_1}{1-r} = \frac{-\frac{1}{6}}{1-\left(-\frac{1}{2}\right)} = \frac{-\frac{1}{6}}{\frac{3}{2}}$$

$$= -\frac{1}{6}\left(\frac{2}{3}\right) = \boxed{-\frac{1}{9}}$$

9) **Section 9.5** (5 points) Find the sum of the 11 terms in the geometric series given below.

$$-\frac{8}{3}+\frac{4}{3}-\frac{2}{3}+\frac{1}{3}-\frac{1}{6}+\frac{1}{12}-\cdots-\frac{1}{384}$$

$$\text{Sum} = \frac{a_1(1-r^n)}{1-r}$$

$$= \frac{-\frac{8}{3}\left(1-\left(-\frac{1}{2}\right)^{11}\right)}{1-\left(-\frac{1}{2}\right)}$$

$$= \frac{-\frac{8}{3}\left(1-\left(-\frac{1}{2}\right)^{11}\right)}{\frac{3}{2}}$$

$$= -\frac{16}{9}\left(1-\left(-\frac{1}{2}\right)^{11}\right)$$

10) **Section 3.1** (6 points) Solve the following system of equations by using the **Graphing Method**.

$$3x - 4y = 24$$
$$3x + 2y = 6$$

$3x - 4y = 24$

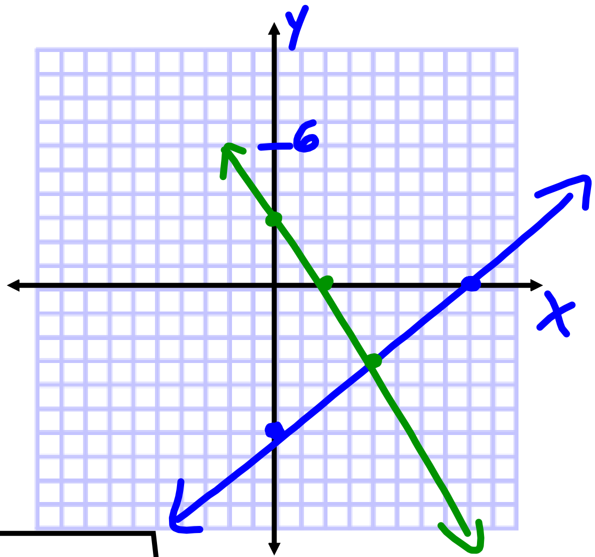
X_{INT} : 8

Y_{INT} : -6

$3x + 2y = 6$

$2y = -3x + 6$

$y = -\frac{3}{2}x + 3$



$\boxed{(4, -3)}$

12) **Section 3.2** (6 points) Solve the following system of equations by using the **Method of Elimination**.

$$3x - 2y = 22$$
$$-5x + 6y = -36$$

$$9x - 6y = 66$$
$$-5x + 6y = -36$$

$$4x = 30$$

$$x = \frac{15}{2}$$

$$15x - 10y = 110$$
$$-15x + 18y = -108$$

$$8y = 2$$

$$y = \frac{1}{4}$$

$$\boxed{\left(\frac{15}{2}, \frac{1}{4}\right)}$$

11) **Section 3.2** (6 points) Solve the following system of equations by using the **Method of Substitution**.

$$6x - 8y = 6$$
$$-3x + 2y = -2$$

$-3x+2y=-2$

$\frac{2y}{2}=\frac{3x}{2}-\frac{2}{2}$

$y=\frac{3}{2}x-1$

$6x-8\left(\frac{3}{2}x-1\right)=6$

$6x-12x+8=6$

$-6x=-2$

$x=\frac{1}{3}$

$y=\frac{3}{2}x-1=\frac{3}{2}\left(\frac{1}{3}\right)-1$

$=\frac{1}{2}-1$

$=-\frac{1}{2}$

$\boxed{\left(\frac{1}{3},-\frac{1}{2}\right)}$

13) **Section 3.5** (8 points) Solve the following system of equations.

① $3x + 3y + 5z = 1$
② $3x + 5y + 9z = 0$
③ $5x + 9y + 17z = 0$

-1 ① $-3x - 3y - 5z = -1$
$+$ ② $3x + 5y + 9z = 0$

$2y + 4z = -1$

-5 ① $-15x - 15y - 25z = -5$
$+3$ ③ $15x + 27y + 51z = 0$

$12y + 26z = -5$

NOTE: MAKE SURE THE SAME VARIABLE HAS BEEN ELIMINATED.

$2y + 4z = -1$
$12y + 26z = -5$ $\rightarrow$

$-12y - 24z = 6$
$12y + 26z = -5$

$2z = 1$

$z = \frac{1}{2}$

$2y + 4\left(\frac{1}{2}\right) = -1$
$2y + 2 = -1$
$2y = -3$

$y = -\frac{3}{2}$

FROM ORIGINAL

$3x + 3y + 5z = 1$

$3x + 3\left(-\frac{3}{2}\right) + 5\left(\frac{1}{2}\right) = 1$

$3x - \frac{9}{2} + \frac{5}{2} = 1$

$3x - 2 = 1$

$3x = 3$

$x = 1$

$\boxed{\left(1, -\frac{3}{2}, \frac{1}{2}\right)}$