Problem 1

1) $(6, \frac{-3}{4}\cdot\pi) = (6, \frac{5}{4}\cdot\pi)$

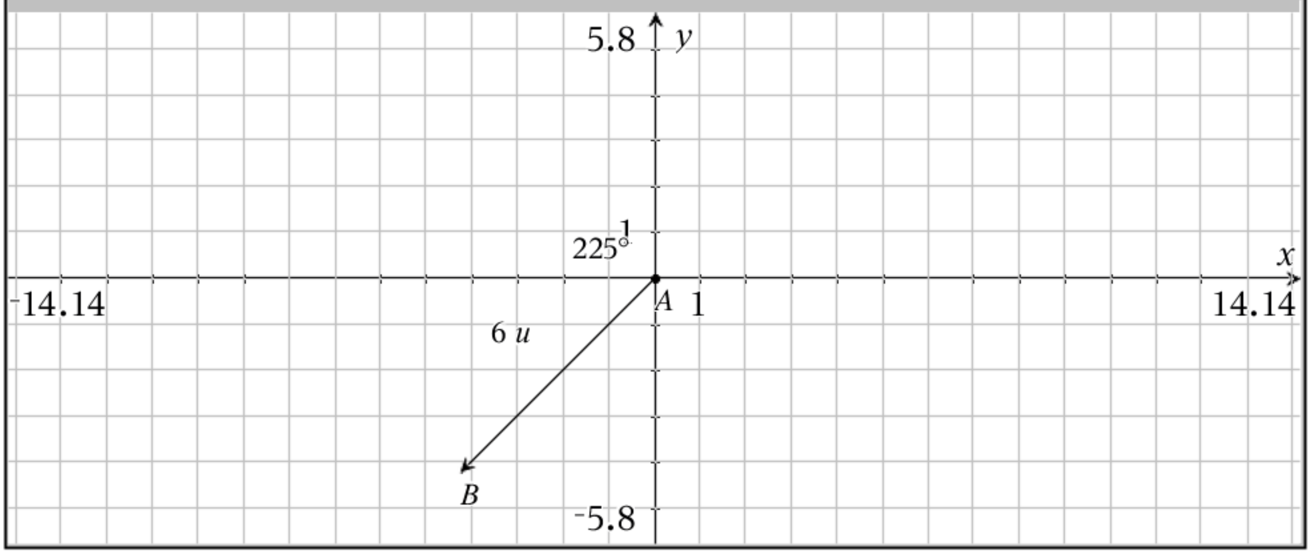
$(6, -135°) = (6, 225°)$

2) Exact $(-3\cdot\sqrt{2}, -3\cdot\sqrt{2})$

3) Approximate $(-4.24, -4.24)$

	A x_list	B y_list	C	D
=				
1	-3* √ (2)	-3* √ (2)		
2				

A1 $=6\cdot\cos(-135)$



Problem 2

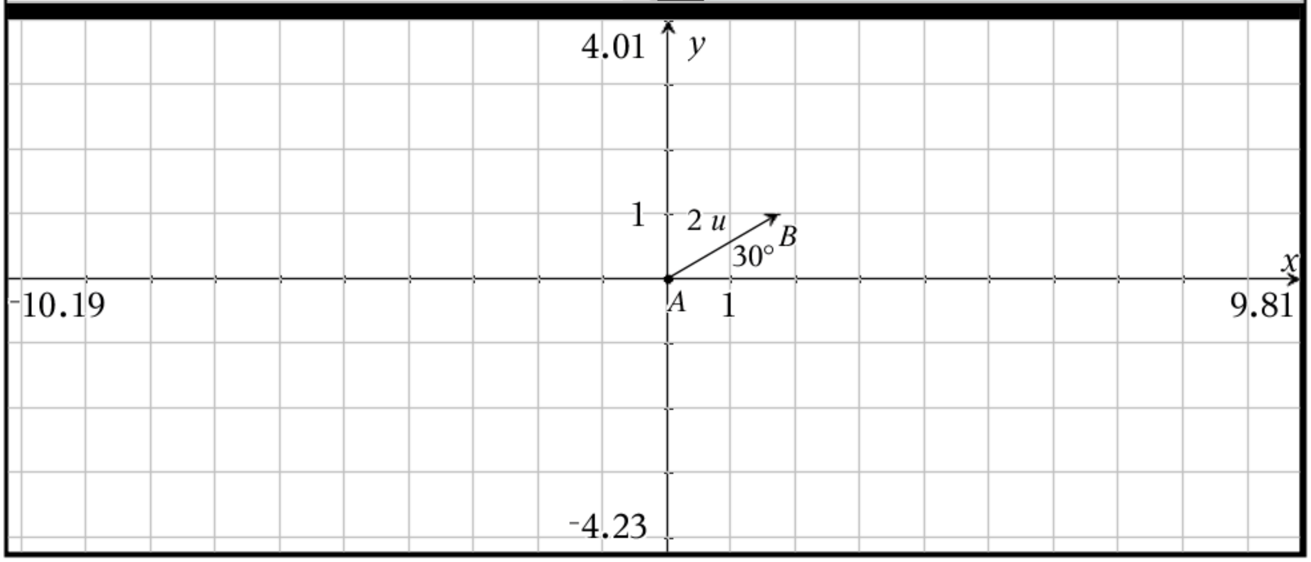
1) $(-2, 210°) = (2, 30°)$

2) Exact $(\sqrt{3}, 1)$

3) Approximate $(1.73, 1)$

	A x_list	B y_list	C	D
=				
1	√ (3)	1		
2				

A1 $=-2\cdot\cos(210)$



Problem 3

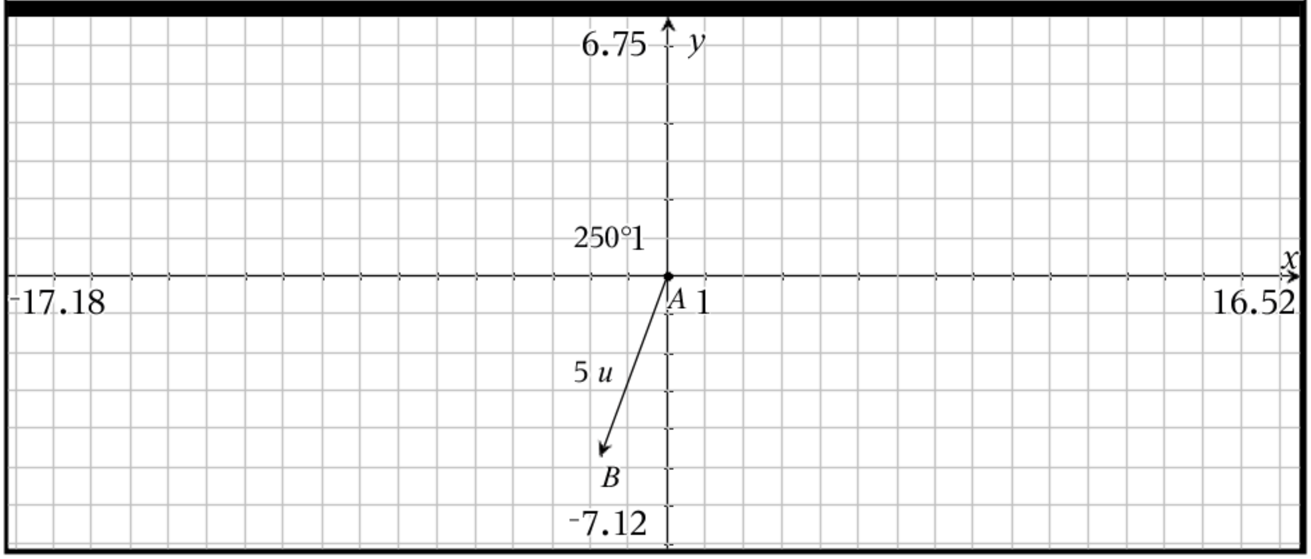
1) $(5, -110°) = (5, 250°)$

2) Exact $(5\cdot\cos(250), 5\cdot\sin(250))$

3) Approximate $(^-1.71, ^-4.7)$

	A x_list	B y_list	C	D
=				
1	-5*sin(20)	-5*cos(2...		
2				

A1 $=5\cdot\cos(^-110)$



Problem 4

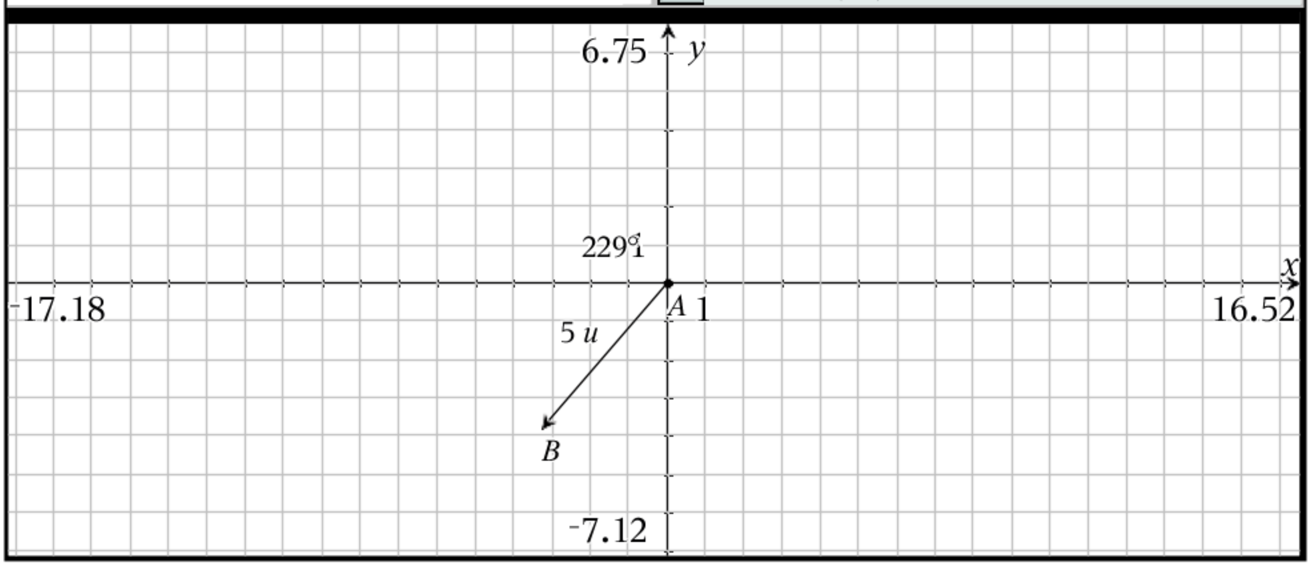
1) $(-5, 49°) = (-5, 49°)$

2) Exact $(5\cdot\cos(229), 5\cdot\sin(229))$

3) Approximate $(^-3.28, ^-3.77)$

	A x_list	B y_list	C	D
=				
1	-5*sin(41)	-5*cos(4...		
2				

A1 $=^-5\cdot\cos(49)$

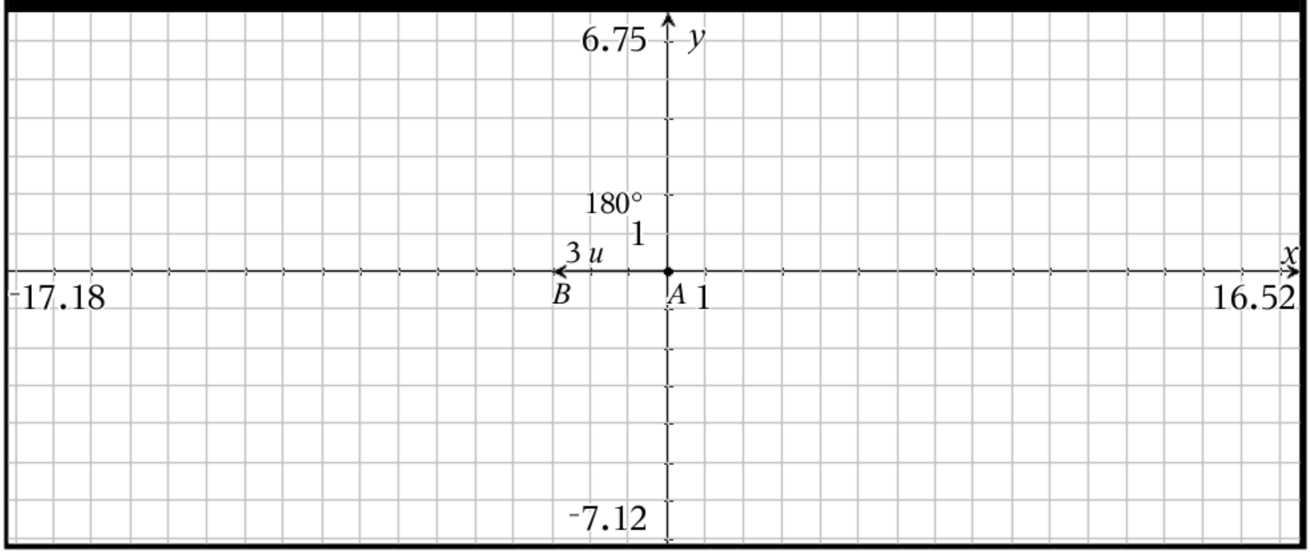


Problem 5

1) $(-3, 0) = (3, 180°) = (-3, 0°)$

	A x_list	B y_list	C	D
=				
1	-3	0		
2				

A1 =-3



Problem 6

1) $(-5, -2)$

$r=\sqrt{5^2+2^2}=\sqrt{29.} \blacktriangleright 5.38516480713$

$\tan^{-1}\left(\frac{2.}{5}\right) \blacktriangleright 21.8014094864$

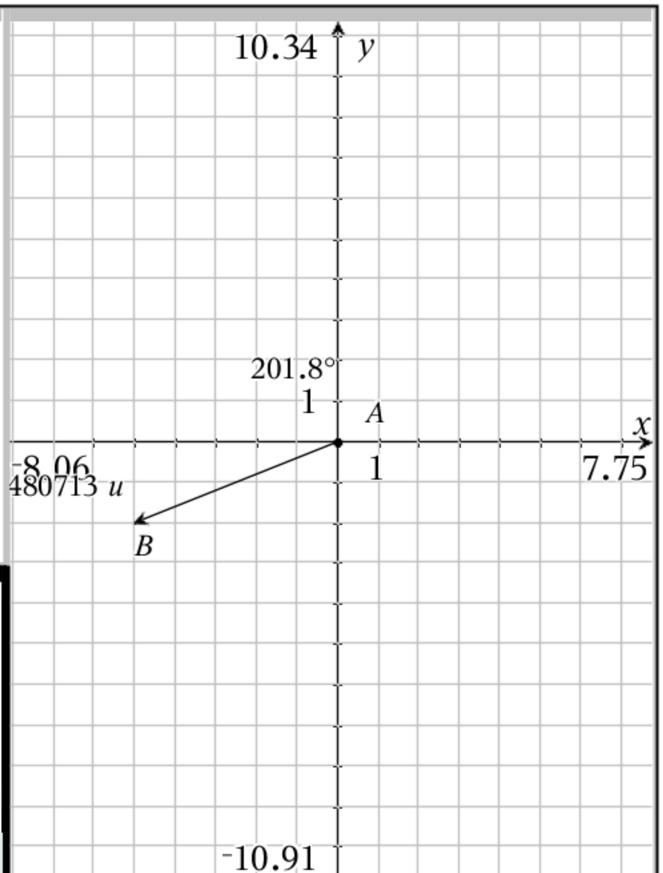
in QIII $\theta = 180+\tan^{-1}\left(\frac{2.}{5}\right)=180+21.8 \blacktriangleright 201.8$

$\left(\sqrt{29}, 180+\tan^{-1}\left(\frac{2.}{5}\right)\right)$

$=\left(5.39, 180+\tan^{-1}\left(\frac{2.}{5}\right) \blacktriangleright 201.801409486\right)$

	A x_list	B y_list	C	D
=				
1	-5	-2		
2				

A1 -5

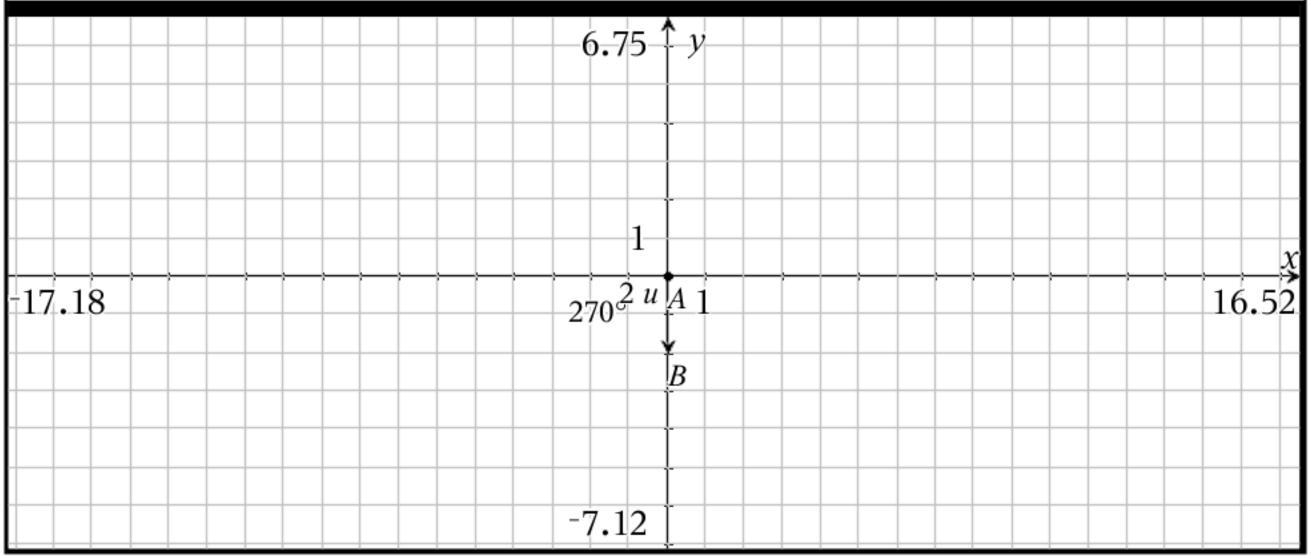


Problem 7

1) (0, −2) =(2, 270 °) =(−2, 90 °)

	A x_list	B y_list	C	D
=				
1	0	-2		
2				

A1 0



Problems 8-11

9) Horizontal Vector Form

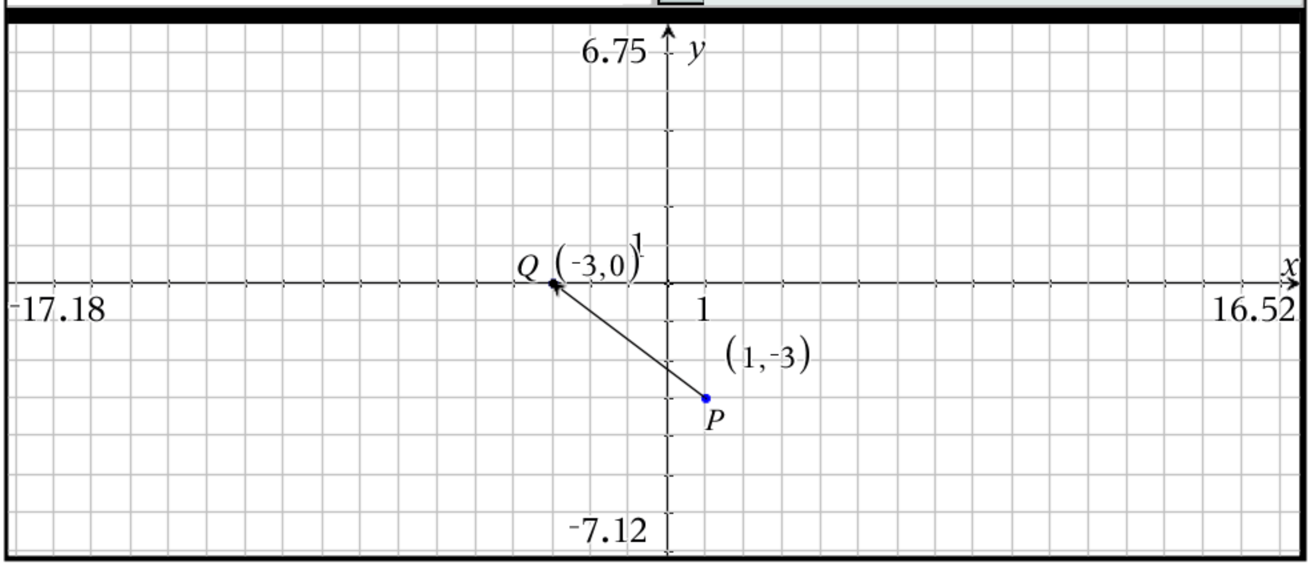
<−4, 3>

Vertical Vector Form $\begin{bmatrix} -4 \\ 3 \end{bmatrix}$

Unit Vector Form −4i+3j

	A x_list	B y_list	C	D
=				
1	1	-3		
2	-3	0		

A1 1



Horizontal Vector Form

<−4, 3>

Vertical Vector Form $\begin{bmatrix} -4 \\ 3 \end{bmatrix}$

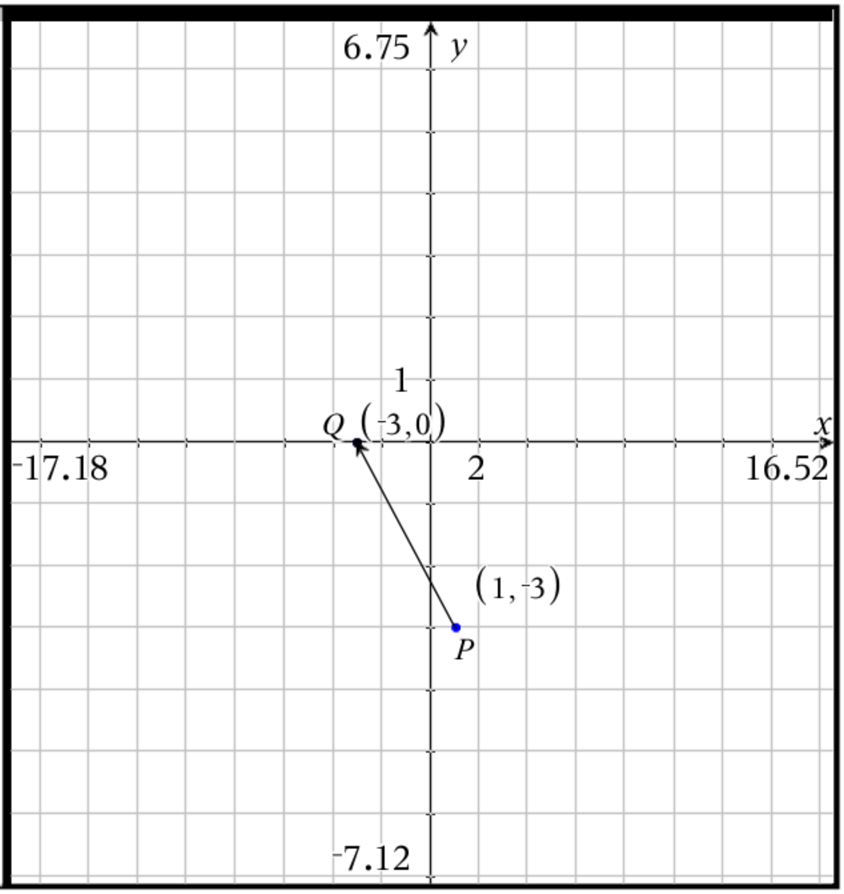
Unit Vector Form −4i+3j

10) Magnitude

$\sqrt{4^2+3^2}$

11) Unit Vector

$\begin{bmatrix} \frac{-4}{5} \\ \frac{3}{5} \end{bmatrix}$



Horizontal Vector Form

<−4, 3>

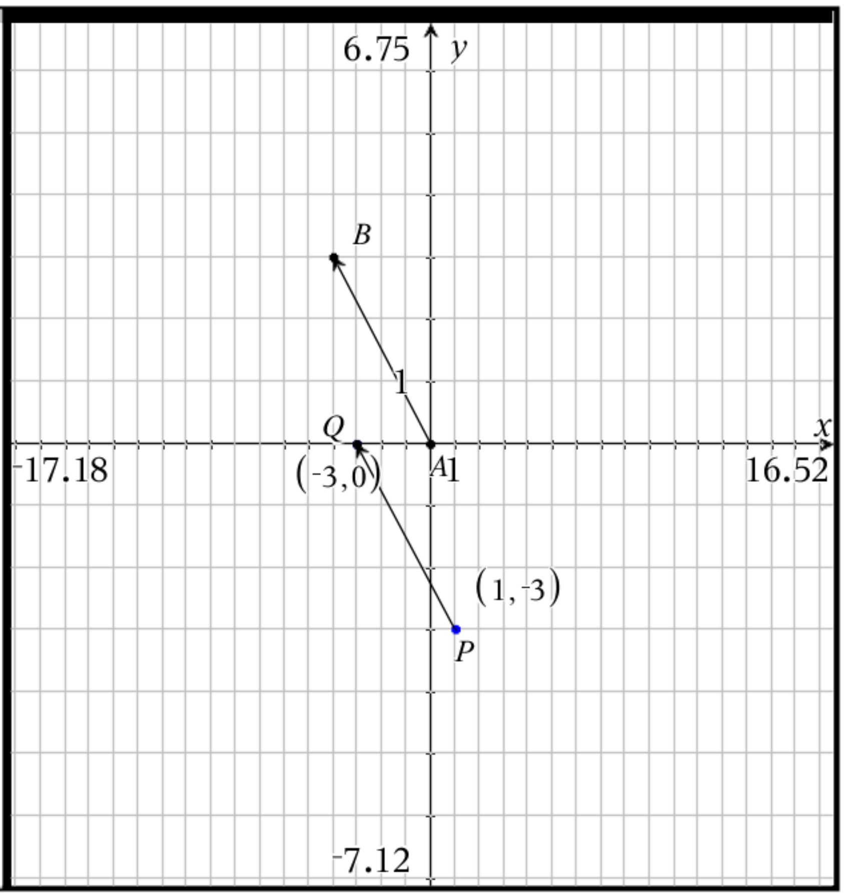
Vertical Vector Form $\begin{bmatrix} -4 \\ 3 \end{bmatrix}$

Unit Vector Form −4i+3j

$\tan^{-1}\left(\frac{3.}{4}\right)$ ▸ 36.8698976458

in QII $\theta = 180 - \tan^{-1}\left(\frac{3.}{4}\right)$

$= 180 - 36.9$ ▸ 143.1



Problems 12-14

$c=\begin{bmatrix}-15\\20\end{bmatrix}$ $d=\begin{bmatrix}14\\-10.5\end{bmatrix}$

12) Opposite direction as d $-\begin{bmatrix}14\\-10.5\end{bmatrix}=\begin{bmatrix}-14\\10.5\end{bmatrix}$

13) Perpendicular to c (this means it has a dot product of 0)

$\begin{bmatrix}-15\\20\end{bmatrix}\cdot\begin{bmatrix}20\\15\end{bmatrix}=-300+300 \blacktriangleright 0$ any vector in the form $\begin{bmatrix}4n\\3n\end{bmatrix}$ for all nonzero n

14) parallel to c that travels in the opposite direction and is one fifth as long

This means $\frac{-1}{5}\cdot\begin{bmatrix}-15\\20\end{bmatrix}=\begin{bmatrix}3\\-4\end{bmatrix}$

Problems 15-19

$a=\begin{bmatrix}-2.5\\6\end{bmatrix}$ $b=\begin{bmatrix}12\\-16\end{bmatrix}$

15) $-3a+4b = -3\cdot\begin{bmatrix}-2.5\\6\end{bmatrix}+6\cdot\begin{bmatrix}12\\-16\end{bmatrix}=\begin{bmatrix}79.5\\-114\end{bmatrix}$

16) $|-3a+4b|$ (this means magnitude of $-3a+4b|$) $=\sqrt{(79.5)^2+(11.4)^2} \blacktriangleright 80.3131994133$

$(79.5)^2+(11.4)^2 \blacktriangleright 6450.21$

17) Unit vector for $-3a+4b = \begin{bmatrix}\frac{79.5}{\sqrt{6450.21}}\\\frac{-16}{\sqrt{6450.21}}\end{bmatrix}=\begin{bmatrix}0.989874648013\\-0.199220054946\end{bmatrix}$

18) $-3a+4b$ in unit vector form $79.5i-114j$

19) $\frac{-5}{2}\cdot\begin{bmatrix}-2.5\\6\end{bmatrix}+\frac{7}{4}\cdot\begin{bmatrix}12\\-16\end{bmatrix}=\begin{bmatrix}27.25\\-43\end{bmatrix}$

Problems 20-21

20) b= $\begin{bmatrix} 12 \\ -16 \end{bmatrix}$ Note this has a magnitude of $\sqrt{12^2+16^2}$ ▸ 20

v= $n\begin{bmatrix} 12 \\ -16 \end{bmatrix}$ Magnitude of 48

20n = 48

$\frac{20 \cdot n}{20} = \frac{48}{20.}$ ▸ $n=2.4$ or -2.4

21) a= $\begin{bmatrix} -1.25 \\ 3 \end{bmatrix}$ is parallel to k = $\begin{bmatrix} 15 \\ w \end{bmatrix}$

$\begin{bmatrix} -1.25n \\ 3n \end{bmatrix} = \begin{bmatrix} 15 \\ w \end{bmatrix}$ means $-1.25n=15$ n = $\frac{15}{-1.25}$ ▸ $-12.$

means $3 \cdot -12$ =w w = -36

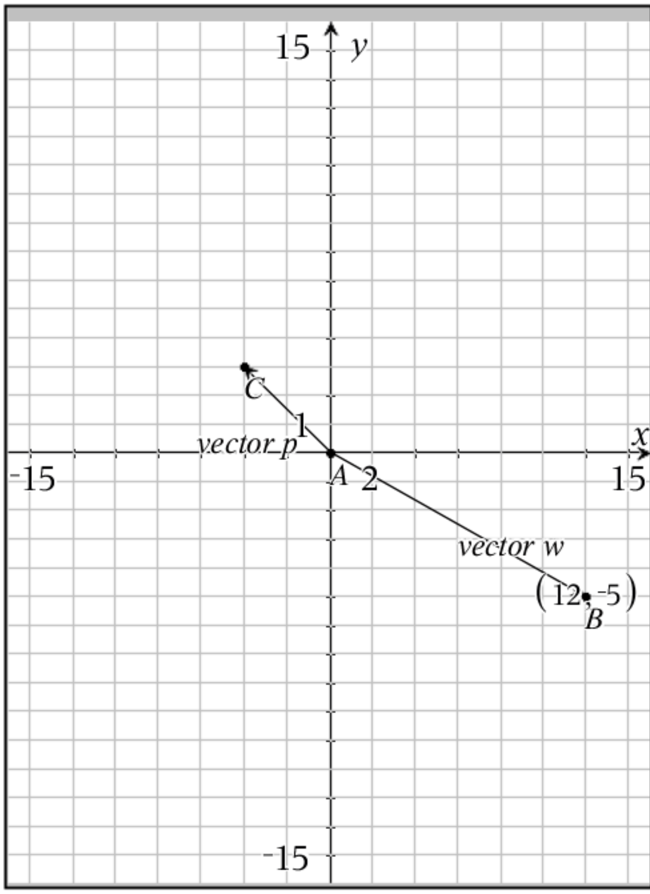
Problem 22

22) $d = \begin{bmatrix} 7 \\ -4 \end{bmatrix}$ is perpendicular to c= $\begin{bmatrix} -9 \\ g \end{bmatrix}$

This means dot product =0

$\begin{bmatrix} 7 \\ -4 \end{bmatrix} \begin{bmatrix} -9 \\ g \end{bmatrix}$ implies $-63-4g = 0$ and $63 = -4g$ or g = $\frac{63}{-4.}$ ▸ -15.75

Problem 23 -24



23) and 24)

$w=\begin{bmatrix} 12 \\ -5 \end{bmatrix}$ $p=\begin{bmatrix} -4 \\ 3 \end{bmatrix}$

dot product wp $=-48+-15=-63$

magnitude of w $=\sqrt{12^2+5^2}$ ▸ 13

magnitude of p $=\sqrt{4^2+3^2}$ ▸ 5

$\cos\ \theta = \frac{-63}{13\cdot 5}$ ▸ $\frac{-63}{65}$

$\theta=\cos^{-1}\left(\frac{-63}{65}\right)=165.749967302$

Problem 25-26

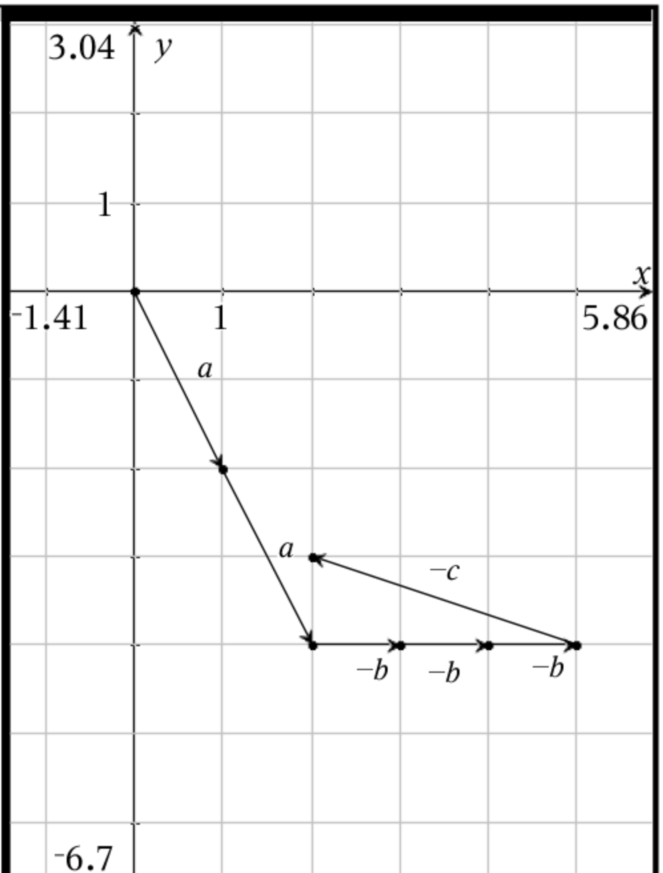
$a=\begin{bmatrix} 1 \\ -2 \end{bmatrix}$ $b=\begin{bmatrix} -1 \\ 0 \end{bmatrix}$ $c=\begin{bmatrix} 3 \\ -1 \end{bmatrix}$

25) m = 2a−3b−c

26) $m= 2\begin{bmatrix} 1 \\ -2 \end{bmatrix}-3\begin{bmatrix} -1 \\ 0 \end{bmatrix}-\begin{bmatrix} 3 \\ -1 \end{bmatrix}$

$=\begin{bmatrix} 2 \\ -4 \end{bmatrix}+\begin{bmatrix} 3 \\ 0 \end{bmatrix}+\begin{bmatrix} -3 \\ 1 \end{bmatrix}$

$=\begin{bmatrix} 2 \\ -3 \end{bmatrix}$



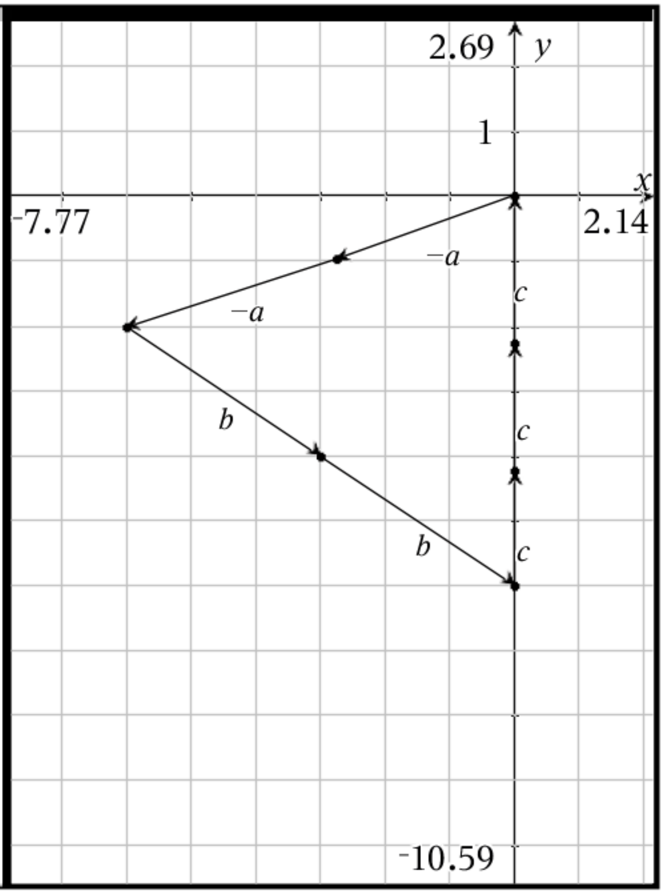
Problem 27-28

27) Vector AH (given vector polygon)

AH = −2a+2b+3c

28) Vector HA (opposite direction vector polygon)

HA =−3c−2b+2a



Problem 1-8

{900,300,−300,−900,....}

$a_1 = 900$ d = −600

$a_n = 900+(n-1)(-600)$

$= 1500-600\cdot n$

1) d = −600

2) $a_{11}=900+(11-1)\cdot {}^-600 = {}^-5100$

{25,55,85,115,......}

$a_1 = 25$ d = 30

$a_n = 25+(n-1)(30)$

$=30\cdot n-5$

3) d = 30

4) $a_{805}=25+(805-1)\cdot 30 = 24145$

{32544,8136,2034,....}

$a_1 = 32544$ $r = \frac{8136}{32544} \blacktriangleright \frac{1}{4} = \frac{2034}{8136} \blacktriangleright \frac{1}{4}$

$a_n = 32544(\frac{1}{4})^{n-1}$

5) $r = \frac{1}{4}$

6) $a_{11}= 32544.\cdot \left(\frac{1}{4}\right)^{601}$

$=32544.\cdot \left(\frac{1}{4}\right)^{602-1} \blacktriangleright 4.725\text{E}{}^-358$

$\{-80000, 20000, -5000, 1250 \ldots\}$

$a_1 = -80000 \quad r = \frac{20000}{-80000} ▸ \frac{-1}{4} = \frac{-5000}{20000} ▸ \frac{-1}{4} \quad \frac{1250}{-5000} ▸ \frac{-1}{4}$

$a_n = -80000\left(\frac{-1}{4}\right)^{n-1}$

7) $r = \frac{-1}{4}$

8) $a_{11} = -80000. \cdot \left(\frac{-1}{4}\right)^{701}$

$= 7.228E{-418}$

Problem 9-11

$\{19, 26, 34, 43, 53, \ldots\}$

$26-19 ▸ 7 \qquad 8-7 ▸ 1$

$34-26 ▸ 8 \qquad 9-8 ▸ 1$

$43-34 ▸ 9 \qquad 10-9 ▸ 1$

$53-43 ▸ 10$

9) $a_1 = 19$

$a_n = a_{n-1} + (7 + (n-2)(1))$

10) $a_n = 19 + \sum_{n=1}^{n-1} (7 + (n-1)(1))$

11) $a_{100} = 19 + \sum_{n=1}^{100-1} (7 + (n-1) \cdot 1) = 5563$

	A num	B diff	C diff_2	D
=				
1	19	7	1	
2	26	8	1	
3	34	9	1	
4	43	10		
5	53			
6				
7				
8				
9				
10				
11				

A1 19

Problems 12-14

{82,76,69,61,....}

$76-82 \blacktriangleright -6$ $\quad -7--6 \blacktriangleright -1$

$69-76 \blacktriangleright -7$ $\quad -8--7 \blacktriangleright -1$

$61-69 \blacktriangleright -8$

12) $61-9=52$, $52-10=42$, $42-11=31$

13) $a_1=82$

$a_n = a_{n-1}+(-6+(n-2)(-1))$

$a_n=82+\sum_{n=1}^{n-1}(-6+(n-1)(-1))$

14) $a_1=82$

$a_8=82+\sum_{n=1}^{7}(-6+(n-1)\cdot -1)=19$

$31-12 \blacktriangleright 19$

Problem 15-17

{−144,2304,−36864,589824....}

$a_1=-144$ $r=\frac{2304}{-144} \blacktriangleright -16 = \frac{-36864}{2304} \blacktriangleright -16$ $\quad \frac{589824}{-36864} \blacktriangleright -16$

15) $589824\cdot -16 \blacktriangleright -9437184$, $-9437184\cdot -16 \blacktriangleright 150994944$, $-150994944\cdot -16 \blacktriangleright 2415919104$

16) $a_n=-144(-16)^{n-1}$

17) $a_8= -144\cdot(-16)^{8-1} \blacktriangleright 38654705664$

Problem 18-20

{1600,400,100,25....}

$a_1 = 1600$ $r = \frac{400}{1600} \blacktriangleright \frac{1}{4} = \frac{100}{400} \blacktriangleright \frac{1}{4} \quad \frac{25}{100} \blacktriangleright \frac{1}{4}$

18) $25\cdot\frac{1}{4} \blacktriangleright \frac{25}{4}, \frac{25}{4}\cdot\frac{1}{4} \blacktriangleright \frac{25}{16}, \frac{25}{16}\cdot\frac{1}{4} \blacktriangleright \frac{25}{64}$

19) $a_n = 1600(\frac{1}{4})^{n-1}$

20) $a_9 = 1600\cdot\left(\frac{1}{4}\right)^{9-1} \blacktriangleright \frac{25}{1024}$

Problem 21-23

{3417,181101,9779454....}

$a_1 = 3417$ $r = \frac{181101}{3417} \blacktriangleright 53 = \frac{9779454}{181101} \blacktriangleright 54$

21) $9779454\cdot 55 \blacktriangleright 537869970$, $537869970\cdot 56 \blacktriangleright 30120718320$,
$30120718320\cdot 57 \blacktriangleright 1716880944240$

22) $a_1 = 3417$ $a_1 = 3417$

$a_n = a_{n-1}(53+(n-2)(1))$ $a_n = 3417\cdot\prod_{n=1}^{n-1}((53+(n-1)(1)))$

23) $1716880944240\cdot 58 \blacktriangleright 99579094765920$, $99579094765920\cdot 59 \blacktriangleright 5875166591189280$,
$587516659118928\cdot 60 \blacktriangleright 35250999547135680$,
$35250999547135680\cdot 61 \blacktriangleright 2150310972375276480$

23) $a_{10} = 3417\cdot\prod_{n=1}^{10-1}\left(53+(n-1)\cdot 1\right) \blacktriangleright 21503109723752764800$

Problem 24-25

$a_1 = 25$ $a_2 = 125$

24) $d = 125 - 25 = 100$

$a_n = 25 + (n-1)(100)$

25) $r = \frac{125}{25} \blacktriangleright 5$

$a_n = 25 \cdot 5^{n-1}$

Arithmetic Sequence two terms given

$a_7 = 280$ $a_{12} = -270$

This is an arithmetic sequence

$a_7 = 280 = a_1 + (7-1)(d)$

$280 = a_1 + 6d$

$a_{12} = -270 = a_1 + (12-1)(d)$

$-270 = a_1 + 11d$

$5d = {}^{-}270 - 280 \blacktriangleright {}^{-}550$

$d = \frac{{}^{-}550}{5} \blacktriangleright {}^{-}110$

$a1 = 280 - 6 \cdot {}^{-}110 \blacktriangleright 940$

$= {}^{-}270 - 11 \cdot {}^{-}110 \blacktriangleright 940$

RULE

$a_n = 940 + (n-1)(-110)$

Test rule

$a_7 = 940 + (7-1) \cdot {}^{-}110 \blacktriangleright 280$

$a_{12} = 940 + (12-1) \cdot {}^{-}110 \blacktriangleright {}^{-}270$

Geometric Sequence two terms given

$a_4 = \frac{7000}{27}$ $a_9 = \frac{21875000}{6561}$

This is an geometric sequence

$a_4 = \frac{7000}{27} = a_1 r^{4-1}$ $a_9 = \frac{21875000}{6561} = a_1 r^{9-1}$

$\frac{7000}{27} = a_1 r^3$ $\frac{21875000}{6561} = a_1 r^8$

$\frac{a_1 r^8}{a_1 r^3} = \frac{\frac{21875000}{6561}}{\frac{7000}{27}} ▸ \frac{3125}{243}$ $r = \sqrt[5]{\frac{3125}{243}} ▸ \frac{5}{3}$

$a_4 = \frac{7000}{27} = a_1 \cdot \left(\frac{5}{3}\right)^{4-1} ▸ \frac{125 \cdot a_1}{27}$ $a_1 = \frac{7000}{27} \cdot \frac{27}{125} ▸ 56$

RULE $a_n = 56 \cdot \left(\frac{5}{3}\right)^{n-1}$ Test rule $a_4 = 56 \cdot \left(\frac{5}{3}\right)^{4-1} ▸ \frac{7000}{27}$ $a_9 = 56 \cdot \left(\frac{5}{3}\right)^{9-1} ▸ \frac{21875000}{6561}$

Problem 26-29

26) $a_n = 75 + (n-1)(-1.5)$

S method

$a_{100} = 75 + (100-1) \cdot {}^{-}1.5 ▸ a_{100} = {}^{-}73.5$

$S_{100} = \frac{100}{2} \cdot (75 + {}^{-}73.5) ▸ 75.$ Sigma method $\sum_{n=1}^{100} (75 + (n-1) \cdot {}^{-}1.5) ▸ 75.$

27) $a_n = 18 + (n-1)(4.2)$

S method

$a_{50} = 18 + (50-1) \cdot 4.2 ▸ a_{50} = 223.8$

$S_{50} = \frac{50}{2} \cdot (18 + 223.8) ▸ 6045.$ Sigma method $\sum_{n=1}^{50} (18 + (n-1) \cdot 4.2) ▸ 6045.$

28) $a_n=20\left(\frac{5}{7}\right)^{n-1}$

$S_9=20\cdot\frac{1-\left(\frac{5}{7}\right)^9}{1-\frac{5}{7}} ▸ \frac{384004820}{5764801}$

Sigma $\sum_{n=1}^{9}\left(20\cdot\left(\frac{5}{7}\right)^{n-1}\right) ▸ \frac{384004820}{5764801}$

29) $a_n=40\left(\frac{6}{5}\right)^{n-1}$

$S_{12}=40\cdot\frac{1-\left(\frac{6}{5}\right)^{12}}{1-\frac{6}{5}} ▸ \frac{15461133688}{9765625}$

Sigma $\sum_{n=1}^{12}\left(40\cdot\left(\frac{6}{5}\right)^{n-1}\right) ▸ \frac{15461133688}{9765625}$

Problem 30-32

30) $a_n=75+(n-1)(-1.5)$

S method

$a_{18}=75+(18-1)\cdot{}^{-}1.5 ▸ a_{18}=49.5$

$a_{750}=75+(750-1)\cdot{}^{-}1.5 ▸ a_{750}={}^{-}1048.5$

$S_{18}=\frac{18}{2}\cdot(75+49.5) ▸ 1120.5$

Sigma method $\sum_{n=19}^{750}(75+(n-1)\cdot{}^{-}1.5) ▸ {}^{-}366183.$

$S_{750}=\frac{750}{2}\cdot(75+{}^{-}1048.5) ▸ {}^{-}365062.5$

$S_{750}-S_{18}={}^{-}365062.5-1120.5 ▸ {}^{-}366183.$

31) $a_n=20\left(\frac{5}{7}\right)^{n-1}$

$S_2=20\cdot\frac{1-\left(\frac{5}{7}\right)^2}{1-\frac{5}{7}} \blacktriangleright \frac{240}{7}$

Sigma $\sum_{n=3}^{11}\left(20\cdot\left(\frac{5}{7}\right)^{n-1}\right) \blacktriangleright \frac{9600120500}{282475249}$

$S_{11}=20\cdot\frac{1-\left(\frac{5}{7}\right)^{11}}{1-\frac{5}{7}} \blacktriangleright \frac{19284986180}{282475249}$

$\frac{19284986180}{282475249}-\frac{240}{7} \blacktriangleright \frac{9600120500}{282475249}$

32) $a_n=40\left(\frac{6}{5}\right)^{n-1}$

$S_{13}=40\cdot\frac{1-\left(\frac{6}{5}\right)^{13}}{1-\frac{6}{5}} \blacktriangleright \frac{94719927128}{48828125}$

Sigma

$\sum_{n=14}^{20}\left(40\cdot\left(\frac{6}{5}\right)^{n-1}\right) \blacktriangleright \frac{21086333760503808}{3814697265625}$

$S_{20}=40\cdot\frac{1-\left(\frac{6}{5}\right)^{20}}{1-\frac{6}{5}} \blacktriangleright \frac{28486328067378808}{3814697265625}$

$\frac{28486328067378808}{3814697265625}-\frac{94719927128}{48828125} \blacktriangleright \frac{21086333760503808}{3814697265625}$

Problem 33-34

33) $\sum_{n=1}^{17} (40+(n-1)\cdot{}^{-}6) ▸ {}^{-}136$

$40+(n-1)\cdot{}^{-}6$ approaches $-\infty$ as n approaches ∞

34) $\sum_{n=1}^{12} ({}^{-}33+(n-1)\cdot 7) ▸ 66$

${}^{-}33+(n-1)\cdot 7$ approaches ∞ as n approaches ∞

Problem 35-36

35) $\sum_{n=1}^{7} \left(100\cdot \left(\frac{3}{8}\right)^{n-1}\right) ▸ \frac{10474825}{65536}$

$100\cdot \left(\frac{3}{8}\right)^{n-1}$ approaches $\frac{100}{1-\frac{3}{8}} ▸ 160$ as n approaches ∞

36) $\sum_{n=1}^{10} \left(200\cdot \left(\frac{7}{5}\right)^{n-1}\right)$

$200\cdot \left(\frac{7}{5}\right)^{n-1}$ approaches as ∞ n approaches ∞