City A has a latitude of 65° 29' 56" N   City B has a latitude of 20° 59' 15" N

City A is due north of City B

1. Determine how far apart these cities are from each other if we assume radius of earth is about 4000 miles

a. What is the difference in latitude measures in DMS?

   44° 30' 41"

b. What is the difference in latitude measures in DD?

$$=44 \frac{1841}{3600}° \approx 44.511389°$$

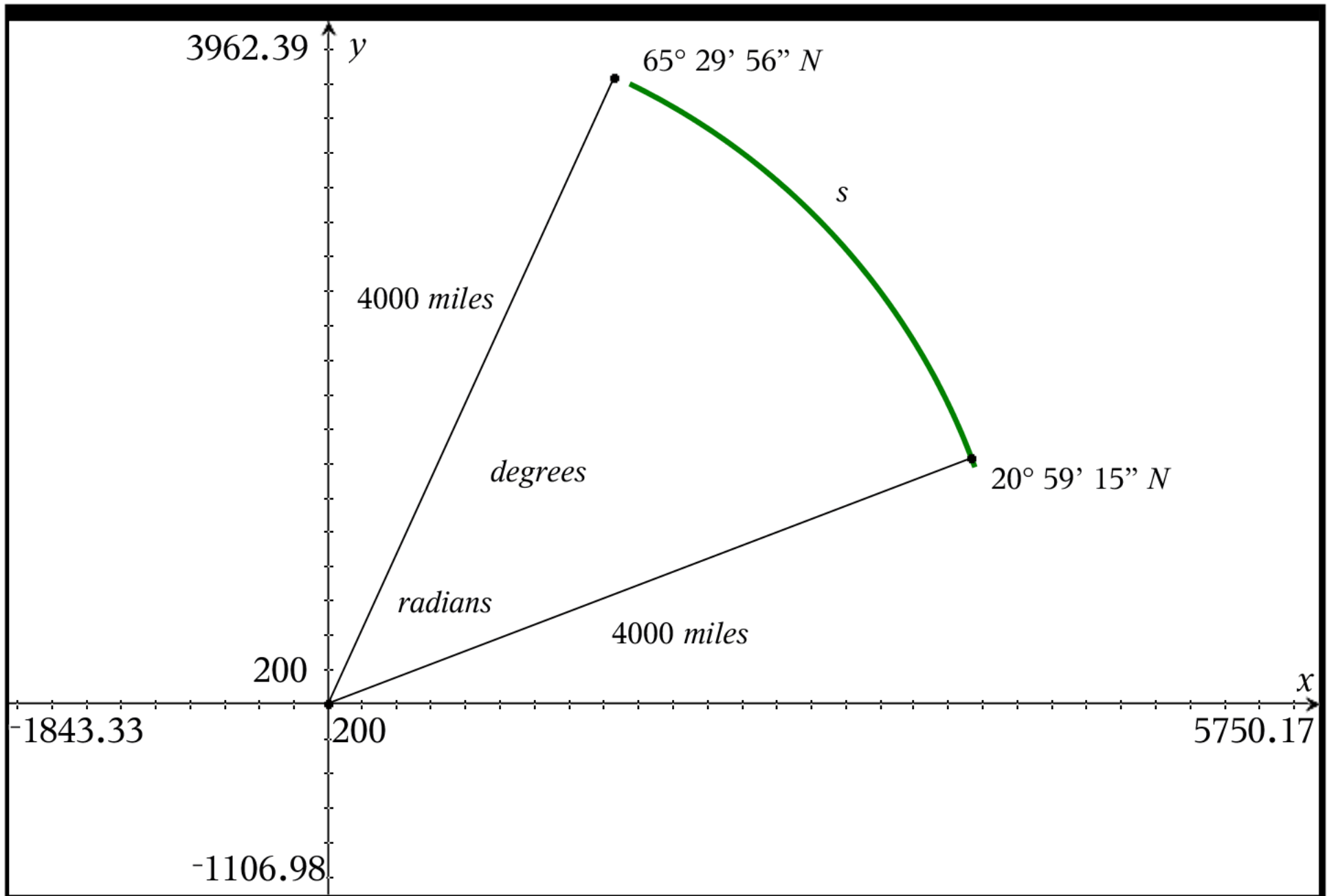c. What is radian measure of the latitude difference?

$$= \frac{160241 \cdot \pi}{648000} \text{ radians} \approx 0.247285 \pi \text{ radians} \approx 0.77687 \text{ radians}$$
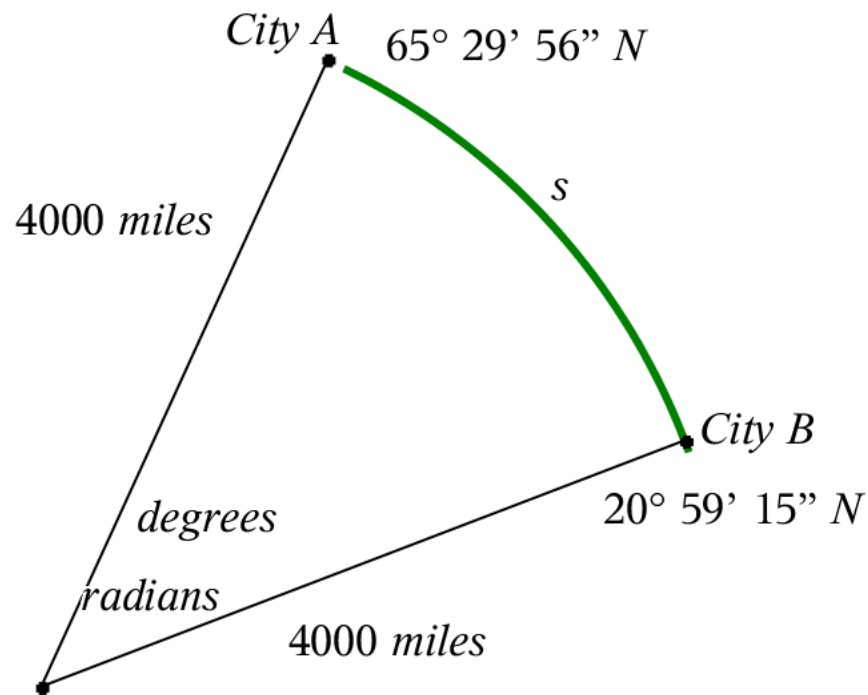
d. What is the EXACT distance between cities?

$$= \frac{160241}{162} \pi \text{ miles}$$

e. What is the APPROXIMATE distance between cities?

$\approx 989.142 \pi$ miles ≈ 3107.481163 miles

3962.39

y

$65°\ 29'\ 56"\ N$

$4000\ miles$

s

$degrees$

$20°\ 59'\ 15"\ N$

$radians$

$4000\ miles$

200

x

$^{-}1843.33$

200

5750.17

$^{-}1106.98$

Step 1 Determine DMS difference

65° 29' 56" N − 20° 59' 15" N

64° 60+29' 56" N − 20° 59' 15" N

64° 89' 56" N − 20° 59' 15" N

44° 30' 41"

Step 2 Determine DD

$$44°\ 30'\ 41'' = 44 + \frac{30}{60} + \frac{41}{3600}\ °$$

$$= 44\ \frac{1841}{3600}\ °$$

$$\approx 44.511389\ °$$

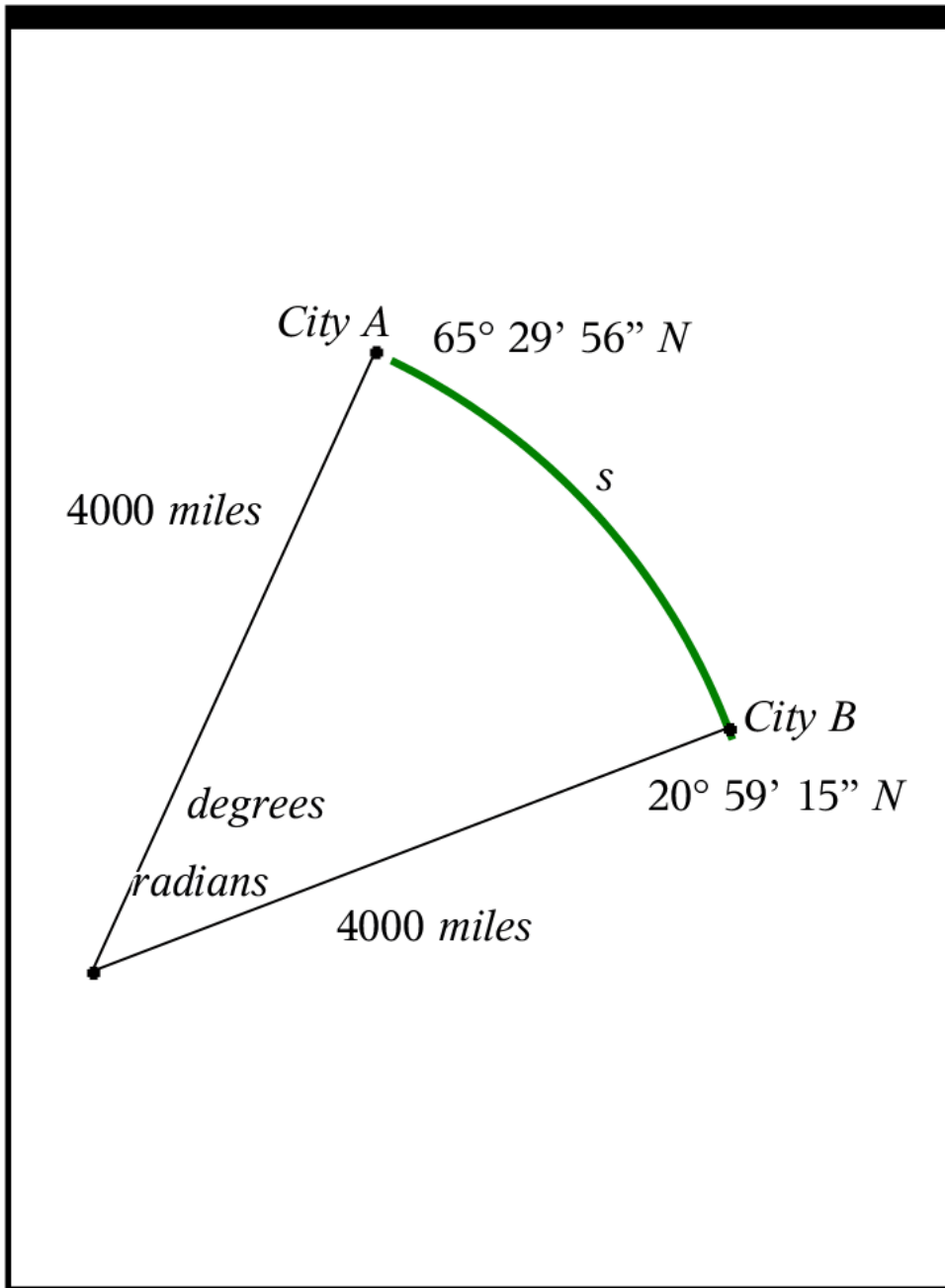DD Difference $= 44\dfrac{1841}{3600}$ °

≈ 44.511389 °

Step 3 Determine radians

$$\left(44\dfrac{30}{60}+\dfrac{41}{3600}\ °\right)\left(\dfrac{\pi\ \textbf{radians}}{180°}\right)$$

$$=\dfrac{160241\cdot\pi}{648000}\ \text{radians}$$

$\approx 0.247285\ \pi\ \text{radians}$

$\approx 0.77687\ \text{radians}$

City A   65° 29' 56" N

4000 miles

s

City B

degrees

radians

20° 59' 15" N

4000 miles

City A   65° 29' 56" N

s

4000 miles

City B

20° 59' 15" N

degrees

radians

4000 miles

DMS difference 44° 30' 41"

DD Difference $= 44\dfrac{30}{60} + \dfrac{41}{3600}$ °

$\approx 44 + \dfrac{30}{60} + \dfrac{41.}{3600}$ °

Radian Difference

$= \dfrac{160241 \cdot \pi}{648000}$ radians
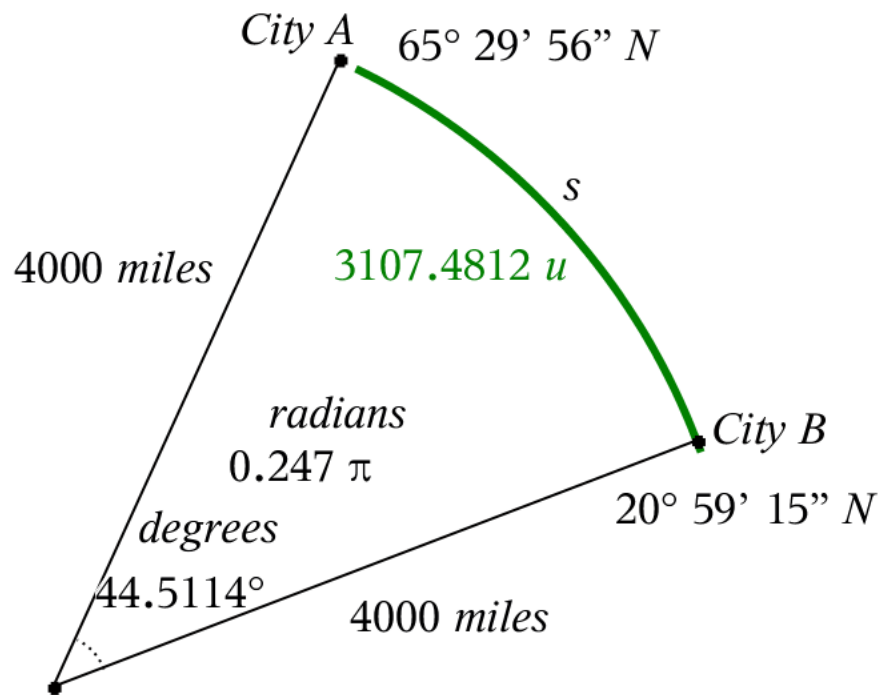
$\approx 0.247285\ \pi$ radians

≈ 0.77687 radians

$s = \theta \cdot r$

$= \left(\dfrac{160241 \cdot \pi}{648000}\right)(4000)$

$= \dfrac{160241}{162}\ \pi$ miles

$\approx 989.142\ \pi$ miles

≈ 3107.481163 miles

City A 65° 29' 56" N

s

4000 miles

3107.4812 u

radians
0.247 π

degrees
44.5114°

City B
20° 59' 15" N

4000 miles

DMS difference 44° 30' 41"

DD Difference $= 44\dfrac{1841}{3600}$ °

≈ 44.511389 °

Radian Difference

$= \dfrac{160241 \cdot \pi}{648000}$ radians

$\approx 0.247285\ \pi$ radians

≈ 0.77687 radians

s = $\theta \cdot r$

$= (0.777\ )(4000)$

$\approx 3108.$ miles

s = $\theta \cdot r$

$= (0.247 \cdot pi\ )(4000)$

≈ 3103.893542 miles