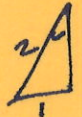


MAT 142 Homework #7 Key

①

1. See attached

2. a.  $\sin^{-1}(\frac{1}{2}) = \frac{\pi}{3}$

b. $\tan^{-1}(-1) = -\frac{\pi}{4}$

c. $\sin^{-1}(\sin \frac{\pi}{3}) = \frac{\pi}{3}$

d. $\tan(\tan^{-1} 125) = 125$

e. $\sin(\sin^{-1} \pi) =$ undefined $\pi > 1$

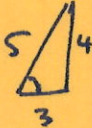
f. $\cos^{-1}(-\frac{\sqrt{2}}{2}) = \frac{3\pi}{4}$

g. $\cos^{-1}(0) = \frac{\pi}{2}$

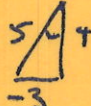
h. $\cos^{-1}(\cos \frac{4\pi}{3}) = \frac{4\pi}{3}$

i. $\tan^{-1}(\tan(-\frac{\pi}{3})) = -\frac{\pi}{3}$

j. $\cos(\cos^{-1} 0.57) = 0.57$

3. a. $\cos(\sin^{-1} \frac{4}{5}) = \frac{3}{5}$ 

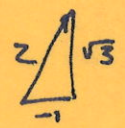
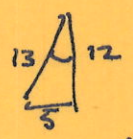
b. $\sin(\cos^{-1}(\frac{\sqrt{2}}{2})) = \frac{\sqrt{2}}{2}$

c. $\sin(\tan^{-1}(-\frac{3}{4})) = -\frac{3}{5}$ 

d. $\cot(\sin^{-1} \frac{5}{13}) = \frac{12}{5}$

e. $\sec(\sin^{-1}(-\frac{1}{2})) = -\frac{2}{\sqrt{3}}$

f. $\csc(\cos^{-1}(-\frac{\sqrt{3}}{2})) = -2$

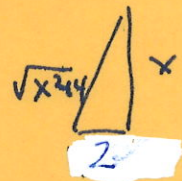
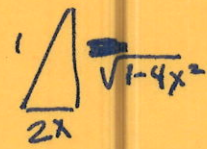
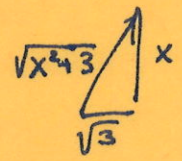
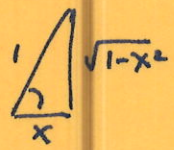


4. a. $\tan(\cos^{-1} x) = \frac{\sqrt{1-x^2}}{x}$

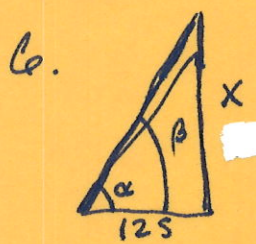
b. $\cot(\tan^{-1}(\frac{x}{\sqrt{3}})) = \frac{\sqrt{3}}{x}$

c. $\sin(\cos^{-1} 2x) = \frac{\sqrt{1-4x^2}}{2x}$

d. $\sec(\sin^{-1}(\frac{x}{\sqrt{x^2+4}})) = \frac{\sqrt{x^2+4}}{2}$



5. See attached



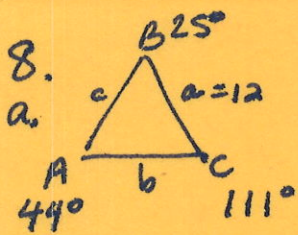
$\alpha = 19.2^\circ, \beta = 36.7^\circ$

$\frac{x_1}{125} = \sin \alpha \Rightarrow x_1 = 125 \sin(19.2) \approx 41.1 \text{ ft}$

$\frac{x_2}{125} = \sin \beta \Rightarrow x_2 = 125 \sin(36.7) \approx 65.7 \text{ ft}$

$65.7 - 41.1 = 24.6 \text{ ft increase}$

7. a. N 70° E
 b. S 35° E
 c. S 15° W
 d. N 80° W

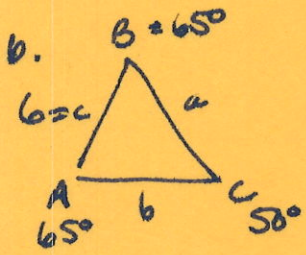


$$\frac{\sin 44^\circ}{12} = \frac{\sin 25^\circ}{b}$$

$$12 \frac{\sin 25^\circ}{\sin 44^\circ} = b = 7.3$$

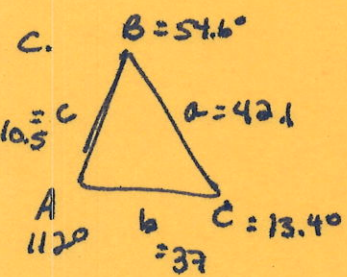
$$\frac{\sin 44^\circ}{12} = \frac{\sin 111^\circ}{c}$$

$$12 \frac{\sin 111^\circ}{\sin 44^\circ} = c = 16.1$$



$$\frac{\sin 50^\circ}{b} = \frac{\sin 65^\circ}{a}$$

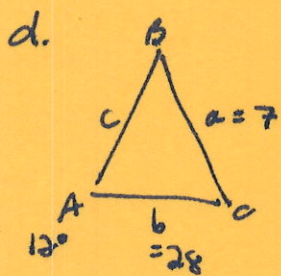
$$b \frac{\sin 65^\circ}{\sin 50^\circ} = a = 7.1 = b$$



$$\frac{\sin 112^\circ}{42.1} = \frac{\sin B}{37} \Rightarrow \sin B = \frac{37 \sin 112^\circ}{42.1} \quad B = 54.6^\circ$$

$$\frac{\sin 13.4^\circ}{c} = \frac{\sin 112^\circ}{42.1}$$

$$c = \frac{42.1 \sin 13.4^\circ}{\sin 112^\circ} = 10.5$$



$$\frac{\sin 12^\circ}{7} = \frac{\sin B}{28} \Rightarrow \frac{28 \sin 12^\circ}{7} = \sin B \quad B = 56.3$$

$$B = 123.7^\circ$$

if $B = 56.3$
 $C = 111.7^\circ$

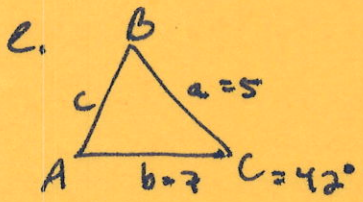
if $B = 123.7^\circ$
 $C = 44.3^\circ$

$$\frac{\sin 111.7^\circ}{c} = \frac{\sin 12^\circ}{7}$$

$$7 \frac{\sin 111.7^\circ}{\sin 12^\circ} = c = 31.28$$

$$\frac{\sin 44.3^\circ}{c} = \frac{\sin 12^\circ}{7}$$

$$7 \frac{\sin 44.3^\circ}{\sin 12^\circ} = c = 23.51$$

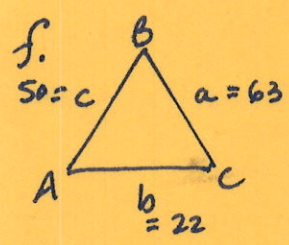


$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$c^2 = 5^2 + 7^2 - 70 \cos 42^\circ = 21.98 \quad c = 4.69 \approx 4.7$$

$$\frac{\sin 42^\circ}{4.7} = \frac{\sin B}{7} \quad \sin B = \frac{7 \sin 42^\circ}{4.7} \quad B = 85.3^\circ$$

$$C = 52.7$$

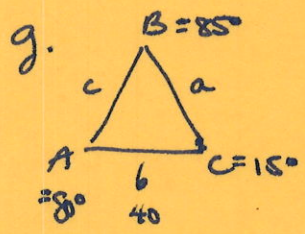


$$63^2 = 50^2 + 22^2 - 2(50)(22) \cos A$$

$$\frac{63^2 - 50^2 - 22^2}{-2(50)(22)} = \cos A \quad A = 116.6^\circ$$

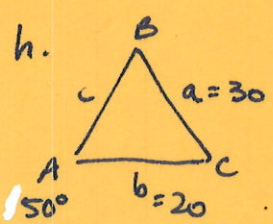
$$\frac{50^2 - 63^2 - 22^2}{-2(63)(22)} = \cos C \quad C = 45.2^\circ$$

$$B = 18.2^\circ$$



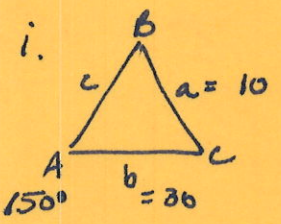
$$\frac{\sin 85}{40} = \frac{\sin 15}{c} \quad 40 \frac{\sin 15}{\sin 85} = c = 10.4$$

$$\frac{\sin(85)}{40} = \frac{\sin 80}{a} \quad \frac{40 \sin 80}{\sin 85} = a = 39.5$$



$$\frac{\sin 50}{30} = \frac{\sin B}{20} \quad 20 \frac{\sin 50}{30} = \sin B \quad B = 30.7^\circ$$

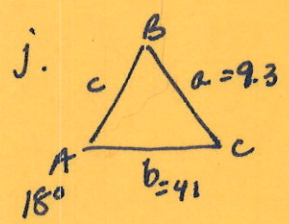
$$C = 99.3 \quad \frac{\sin 50}{30} = \frac{\sin 99.3}{c} \Rightarrow c = \frac{30 \sin 99.3}{\sin 50} = 38.6$$



$$\frac{\sin 150}{10} = \frac{\sin B}{30} \quad \sin B = \frac{30 \sin 150}{10} = 1.5$$

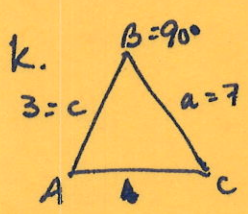
no B

no triangle



$$\frac{\sin 18}{9.3} = \frac{\sin B}{41} \quad \sin B = \frac{41 \sin 18}{9.3}$$

no triangle
no B

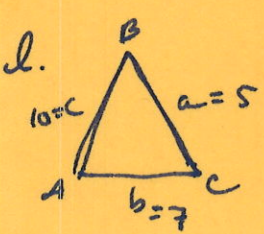


$$3^2 + 7^2 = 58$$

$$c = \sqrt{58} \approx 7.6$$

$$\sin^{-1}\left(\frac{7}{\sqrt{58}}\right) = 66.8^\circ$$

$$\sin^{-1}\left(\frac{3}{\sqrt{58}}\right) = 23.2^\circ$$



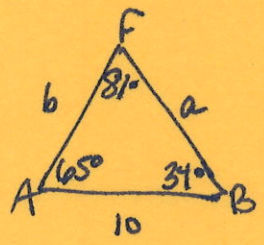
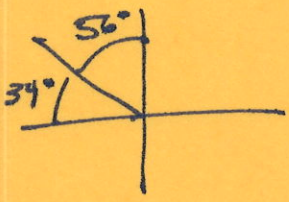
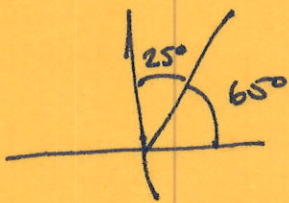
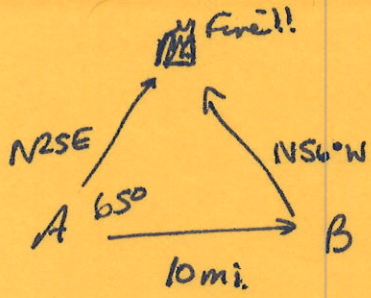
$$c^2 = b^2 + a^2 - 2ab \cos C$$

$$\frac{10^2 - 5^2 - 7^2}{-2(5)(7)} = \cos C \quad C = 111.8^\circ$$

$$\frac{7^2 - 10^2 - 5^2}{-2(10)(5)} = \cos B \quad B = 40.5^\circ$$

$$A = 27.7^\circ$$

9.



$$\frac{\sin 81^\circ}{10} = \frac{\sin 65^\circ}{a}$$

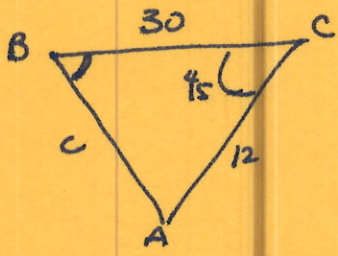
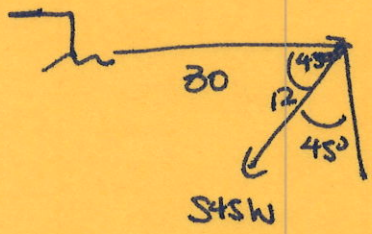
$$\frac{\sin 81}{10} = \frac{\sin 34}{b}$$

$$\frac{10 \sin 65^\circ}{\sin 81} = a = 9.2$$

$$\frac{10 \sin 34^\circ}{\sin 81} = b = 5.7$$

The fire is 9.2 miles from B and 5.7 miles from station A

10.



$$30^2 + 12^2 - 2(30)(12)\cos 45^\circ = c^2$$

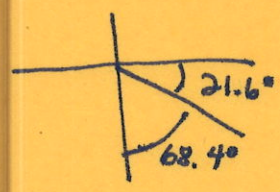
$$c = 23.1 \text{ miles from pier}$$

$$\frac{\sin 45^\circ}{23.1} = \frac{\sin B}{12}$$

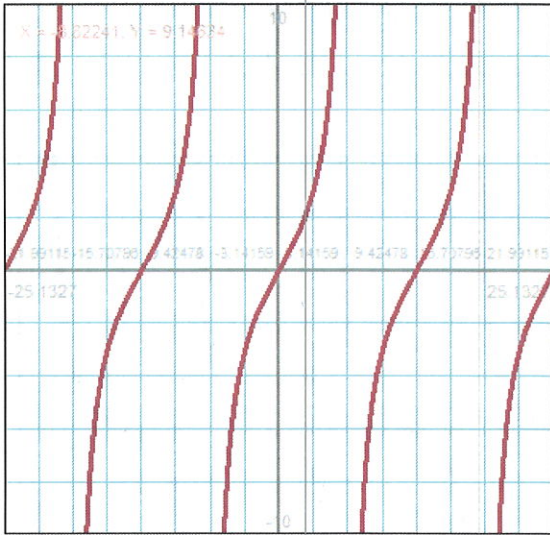
$$\frac{12 \sin 45^\circ}{23.1} = \sin B$$

$$B = 21.6^\circ$$

bearing S68.4°E

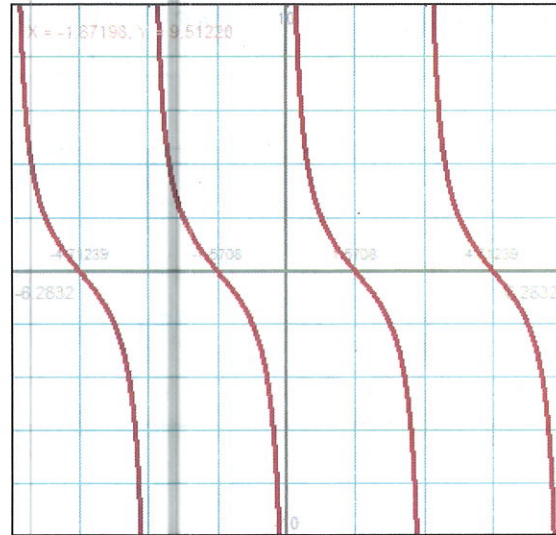


1.
A



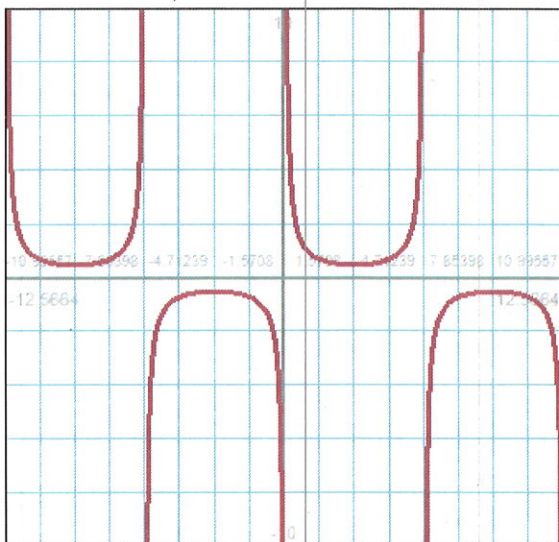
Old x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
Old y	0	1	UNDEF	-1	0
New x	0	π	2π	3π	4π
New y	0	3	UNDEF	-3	0

B



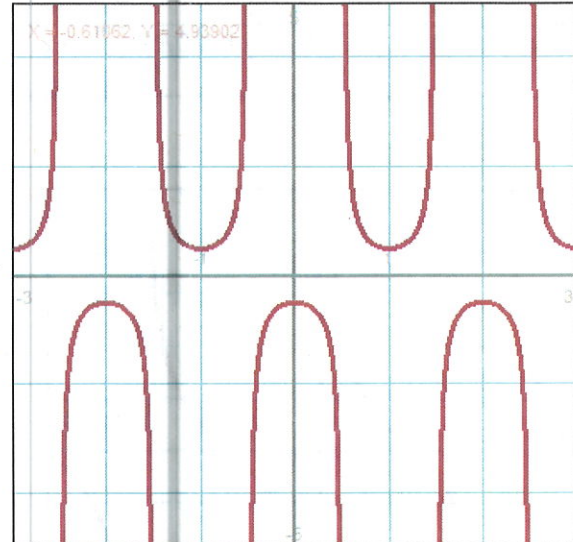
Old x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
Old y	UNDEF	1	0	-1	UNDEF
New x	0	$\frac{3\pi}{8}$	$\frac{3\pi}{4}$	$\frac{9\pi}{8}$	$\frac{3\pi}{2}$
New y	UNDEF	-1	0	1	UNDEF

C



Old x	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Old y	UNDEF	1	UNDEF	-1	UNDEF
New y					

D

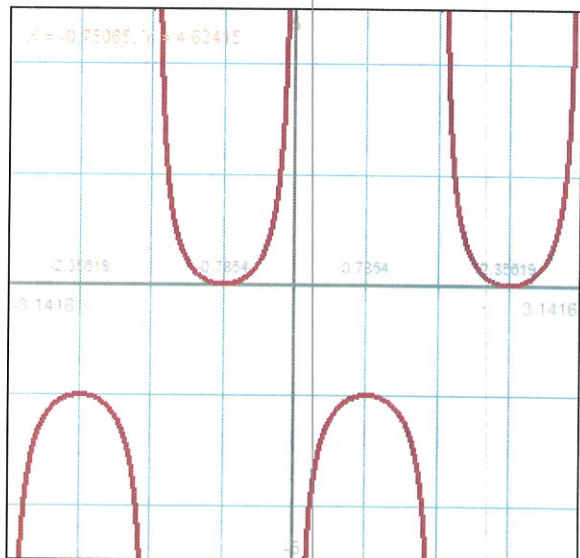


Old x	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Old y	1	UNDEF	-1	UNDEF	1
New y					

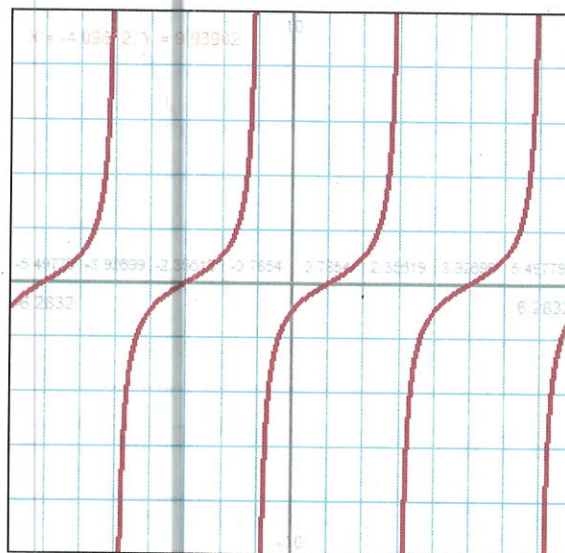
New x	0	π	2π	3π	4π
New y	UNDEF	$\frac{1}{2}$	UNDEF	$-\frac{1}{2}$	UNDEF

0	$\frac{3\pi}{8}$	$\frac{3\pi}{4}$	$\frac{9\pi}{8}$	$\frac{3\pi}{2}$
$-\frac{1}{2}$	UNDEF	$\frac{1}{2}$	UNDEF	$-\frac{1}{2}$

E



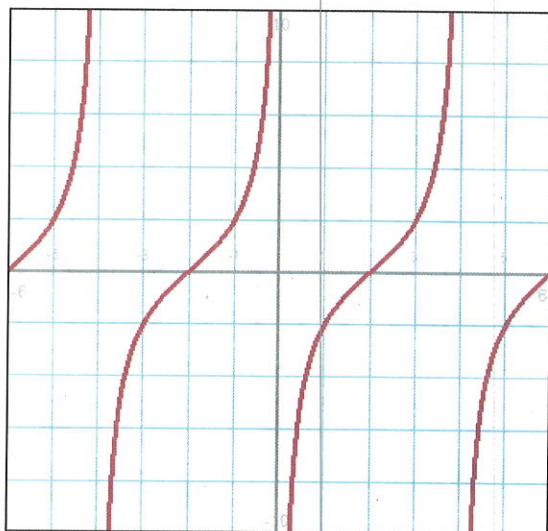
F



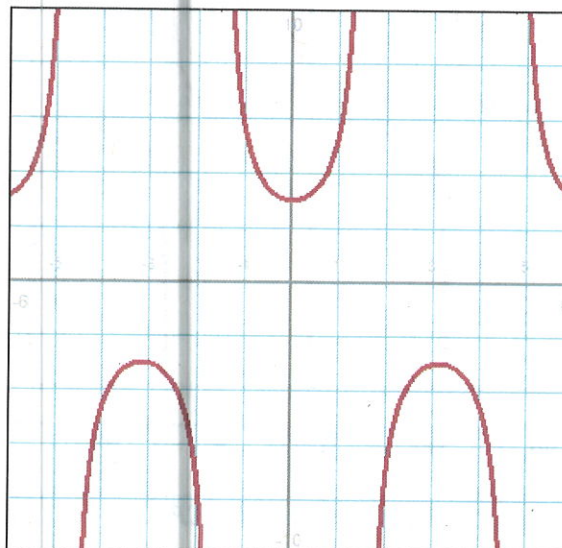
Old x	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Old y	1	UNDEF	-1	UNDEF	1
New x	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
New y	UNDEF	0	UNDEF	-2	UNDEF

0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
0	1	UNDEF	-1	0
$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$
0	1	UNDEF	-1	0

G



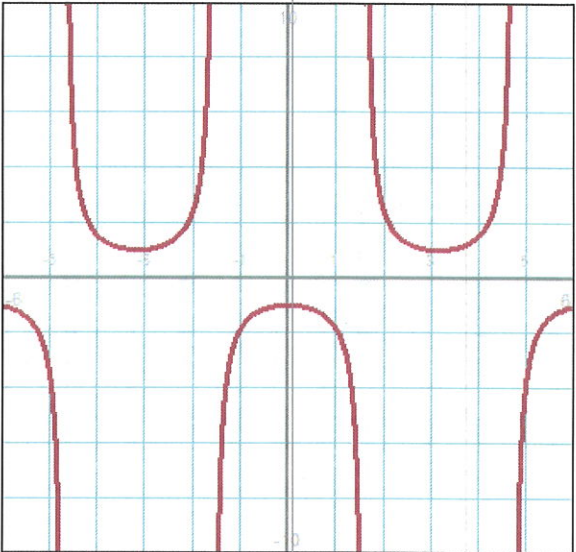
H



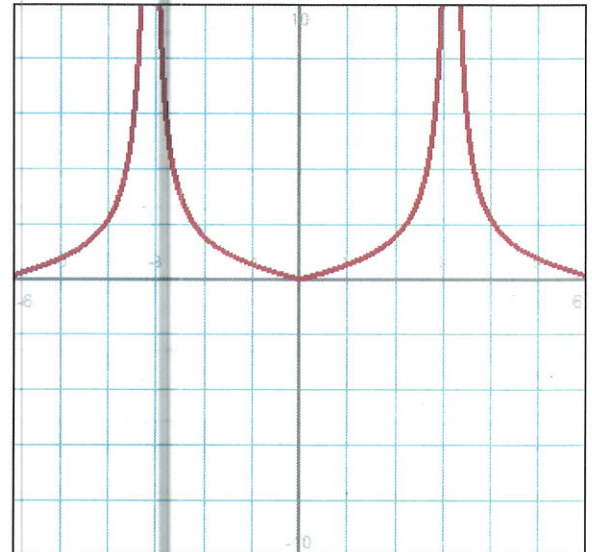
Old x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
Old y	UNDEF	1	0	-1	UNDEF
New x	0	2	4	6	8
New y	UNDEF	-2	0	2	UNDEF

0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
1	UNDEF	-1	UNDEF	1
0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
3	UNDEF	-3	UNDEF	3

I



J

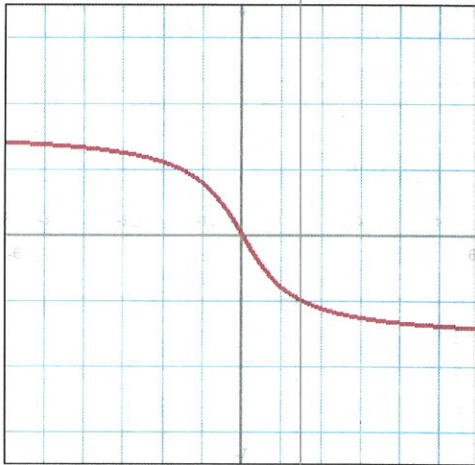


Old x	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Old y	UNDEF	1	UNDEF	-1	UNDEF
New x	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	$\frac{5\pi}{2}$
New y	UNDEF	1	UNDEF	-1	UNDEF

0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
UNDEF	1	0	-1	UNDEF
0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
UNDEF	1	0	1	UNDEF

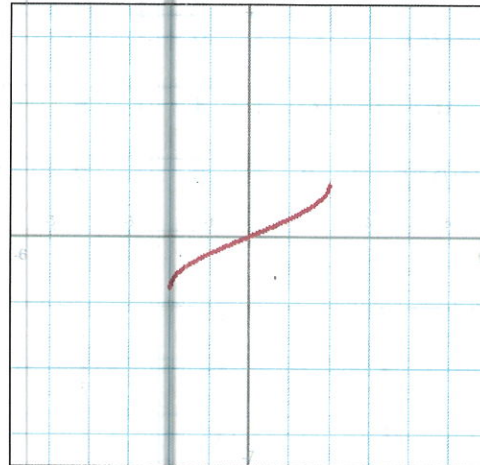
5.

A



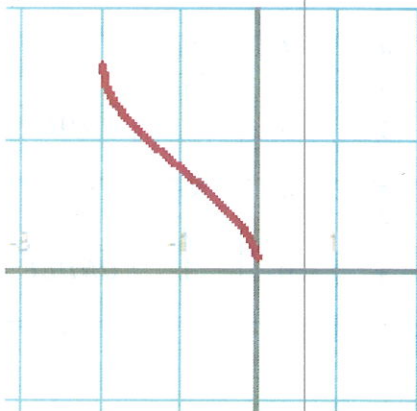
Old x	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
Old y	$-\infty$	-1	0	1	∞
New x	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
New y	$-\infty$	-2	0	2	∞

B



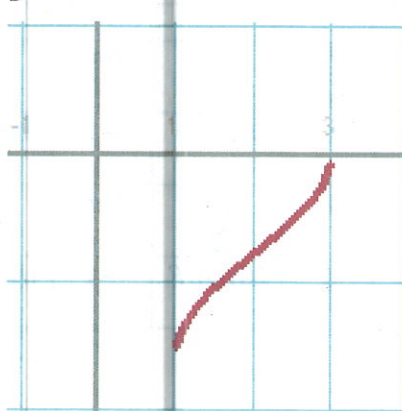
-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1
$-\frac{\pi}{2}$	$-\frac{\pi}{6}$	0	$\frac{\pi}{6}$	$\frac{\pi}{2}$
-2	-1	0	1	2
$-\frac{\pi}{2}$	$-\frac{\pi}{6}$	0	$\frac{\pi}{6}$	$\frac{\pi}{2}$

C



Old x	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1
Old y	π	$\frac{2\pi}{3}$	$\frac{\pi}{2}$	$\frac{\pi}{3}$	0
New x	-2	$-\frac{3}{2}$	-1	$-\frac{1}{2}$	0
New y	π	$\frac{2\pi}{3}$	$\frac{\pi}{2}$	$\frac{\pi}{3}$	0

D



-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1
$-\frac{\pi}{2}$	$-\frac{\pi}{6}$	0	$\frac{\pi}{6}$	$\frac{\pi}{2}$
1	$\frac{3}{2}$	2	$\frac{5}{2}$	3
$-\pi$	$-\frac{2\pi}{3}$	$-\frac{\pi}{2}$	$\frac{\pi}{3}$	0