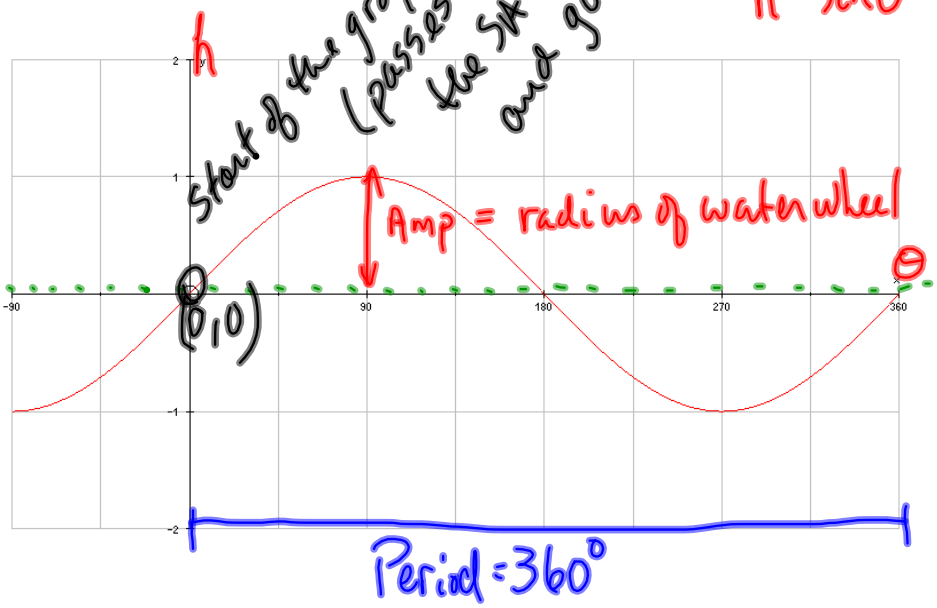
Basic Sinusoidal Function



start of the graph (passes through the SA and going up)

$h = \sin\theta$ $y = \sin x$

SA

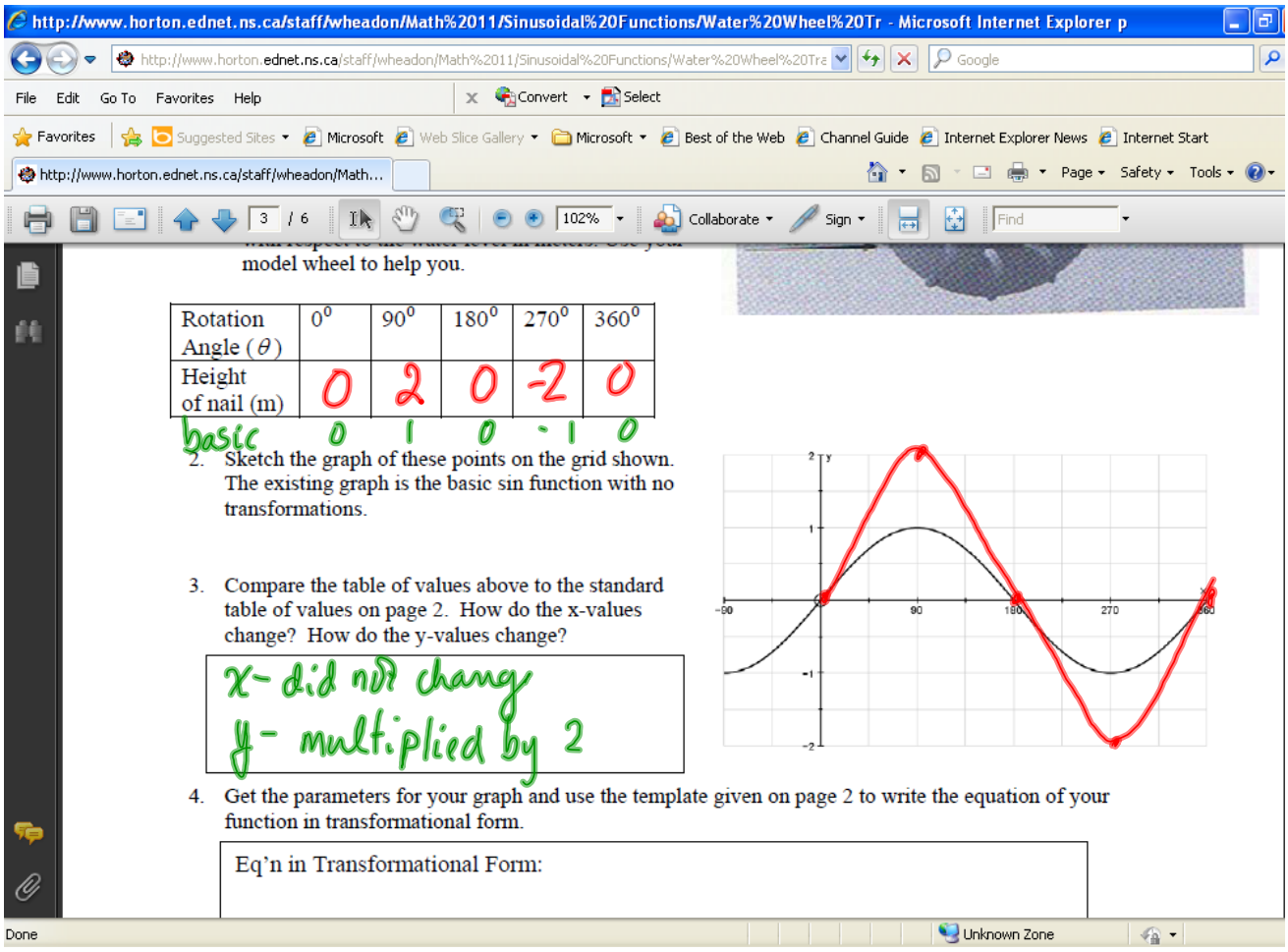
$y = 0$

x	y
0	0
90	1
180	0
270	-1
360	0

In a normal/basic sin curve:

- Amp = 1 → vertical stretch
- SA: $y = 0$ → vertical translation
- Period = 360° → horizontal stretch.
- PS = 0° → horizontal translation

CASE 1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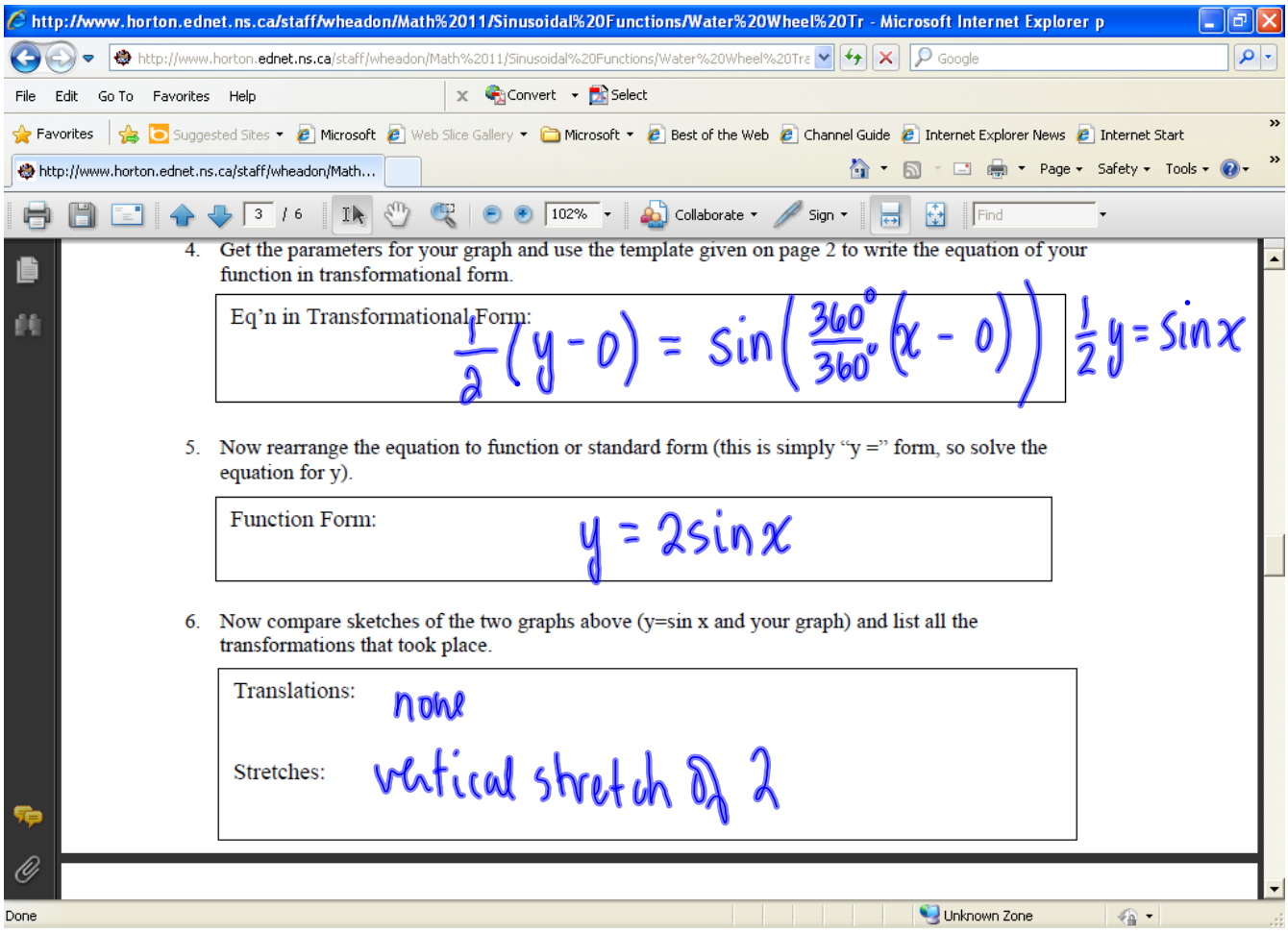
model wheel to help you.
Rotation Angle (θ) 0° 90° 180° 270° 360°
Height of nail (m) 0 2 0 -2 0
basic 0 1 0 -1 0
2. Sketch the graph of these points on the grid shown. The existing graph is the basic sin function with no transformations.
3. Compare the table of values above to the standard table of values on page 2. How do the x-values change? How do the y-values change?
x- did not change
y- multiplied by 2
4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.
Eq'n in Transformational Form:
Done
Unknown Zone

CASE 1 (cont)



4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.

Eq'n in Transformational Form: $\frac{1}{2}(y-0) = \sin\left(\frac{360^\circ}{360^\circ}(x-0)\right)$ $\frac{1}{2}y = \sin x$

5. Now rearrange the equation to function or standard form (this is simply "y =" form, so solve the equation for y).

Function Form: $y = 2\sin x$

6. Now compare sketches of the two graphs above (y=sin x and your graph) and list all the transformations that took place.

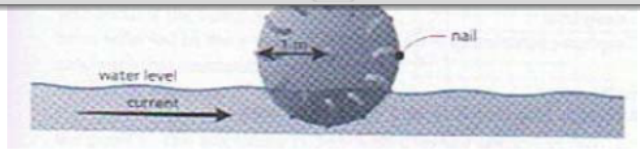
Translations: none

Stretches: vertical stretch of 2

CASE 2

http://www.horton.ednet.ns.ca/staff/wheadon/Math%2011/Sinusoidal%20Functions/Water%20Wheel%20Tr - Microsoft Internet Explorer p

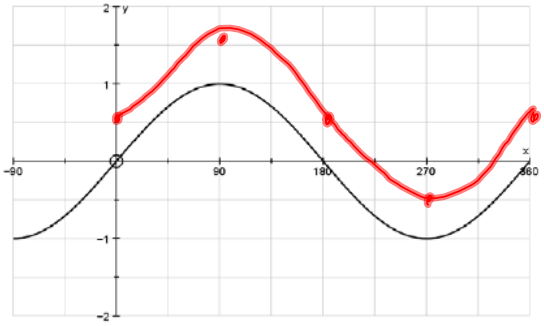
Now consider the following situation: The water level drops during the summer so that only the lower 0.5 m of the wheel is under water. The nail is now positioned 0.5 m above the water level before the wheel starts to rotate.



1. Complete the table where θ is the rotation, in degrees; and h is the height of the nail with respect to the water level in meters.

Rotation Angle (θ)	0^0	90^0	180^0	270^0	360^0
Height of nail (m)	0.5	1.5	0.5	-0.5	0.5

2. Sketch the graph of these points on the grid shown. The existing graph is the basic sin function with no transformations.

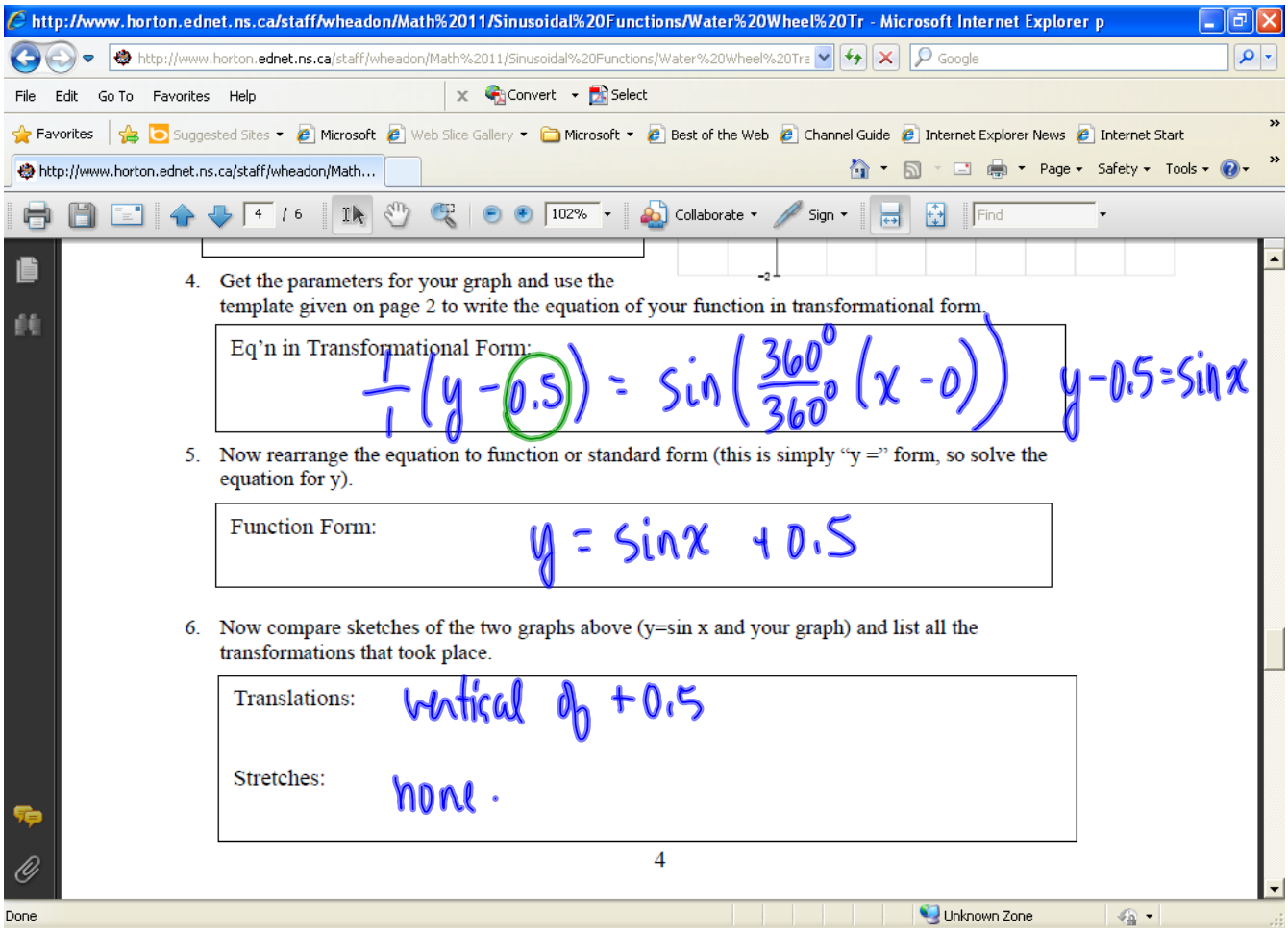


3. Compare the table of values above to the standard table of values on page 2. How do the x-values change? How do the y-values change?

x- no change
y- all increased by 0.5

4. Get the parameters for your graph and use the

CASE 2 (cont)



4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.

Eq'n in Transformational Form: $\frac{1}{1}(y - 0.5) = \sin\left(\frac{360^0}{360^0}(x - 0)\right)$ $y - 0.5 = \sin x$

5. Now rearrange the equation to function or standard form (this is simply "y =" form, so solve the equation for y).

Function Form: $y = \sin x + 0.5$

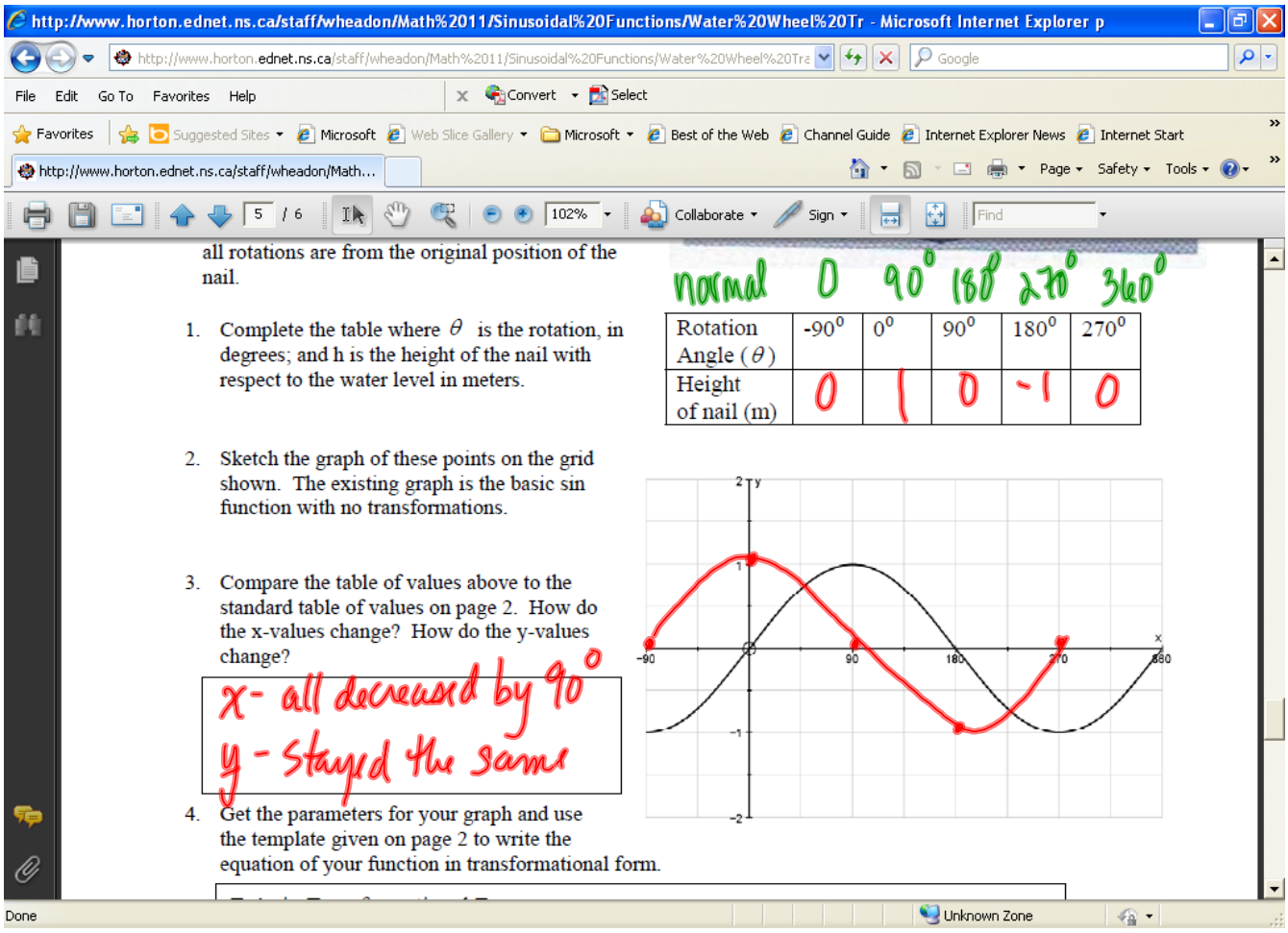
6. Now compare sketches of the two graphs above (y=sin x and your graph) and list all the transformations that took place.

Translations: vertical of +0.5

Stretches: none.

4

CASE 3



all rotations are from the original position of the nail.

normal 0 90° 180° 270° 360°

1. Complete the table where θ is the rotation, in degrees; and h is the height of the nail with respect to the water level in meters.

Rotation Angle (θ)	-90^0	0^0	90^0	180^0	270^0
Height of nail (m)	0	1	0	-1	0

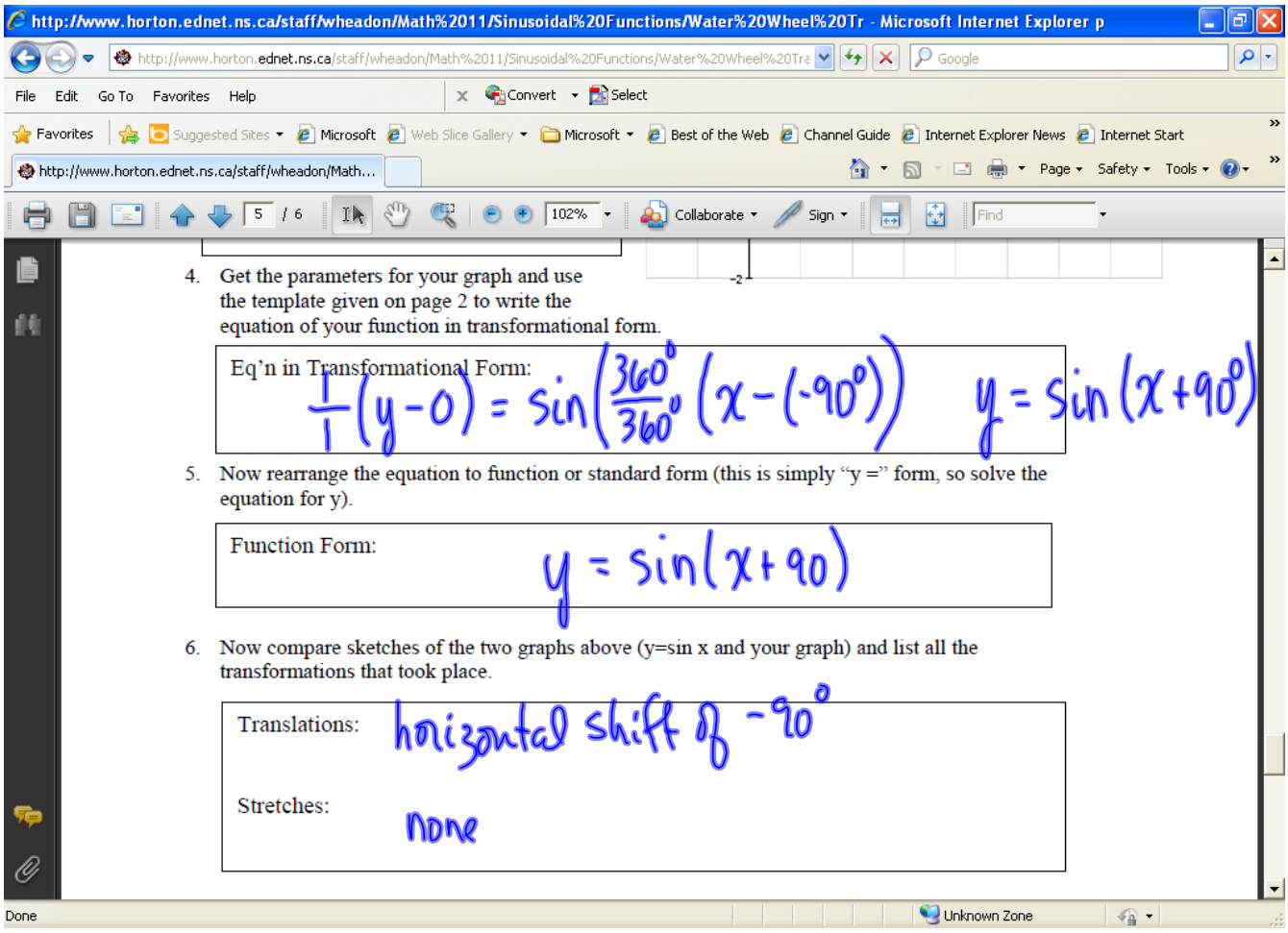
2. Sketch the graph of these points on the grid shown. The existing graph is the basic sin function with no transformations.

3. Compare the table of values above to the standard table of values on page 2. How do the x-values change? How do the y-values change?

x- all decreased by 90°
y - stayed the same

4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.

CASE 3 (cont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4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.
Eq'n in Transformational Form:
$\frac{1}{1}(y-0) = \sin\left(\frac{360^\circ}{360^\circ}(x-(-90^\circ))\right)$
$y = \sin(x+90^\circ)$
5. Now rearrange the equation to function or standard form (this is simply "y =" form, so solve the equation for y).
Function Form:
$y = \sin(x+90)$
6. Now compare sketches of the two graphs above (y=sin x and your graph) and list all the transformations that took place.
Translations:
horizontal shift of -90°
Stretches:
none
Done
Unknown Zone

CASE 4

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revolutions of the flywheel. Notice we are now tracking the height the bolt placed on the flywheel (see diagram).

1. Complete the table where θ is the rotation, in degrees, and h is the height of the bolt with respect to the water level in meters.

normal θ 0 90 180 270 360

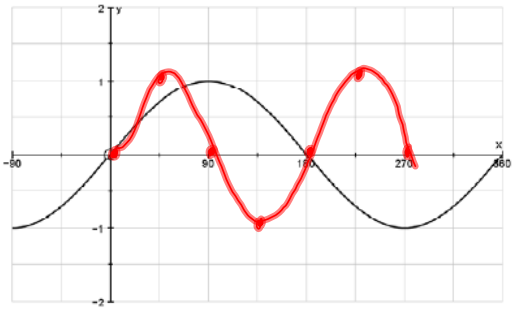
water wheel →

Rotation Angle (θ)	0^0	45^0	90^0	135^0	180^0	225^0	270^0
Height of nail (m)	0	1	0	-1	0	1	0

fly wheel

bolt

2. Sketch the graph of these points on the grid shown. The existing graph is the basic sin function with no transformations.



3. Compare the table of values above to the standard table of values on page 2. Write a mapping rule for your graph below. How do the x-values change? How do the y-values change?

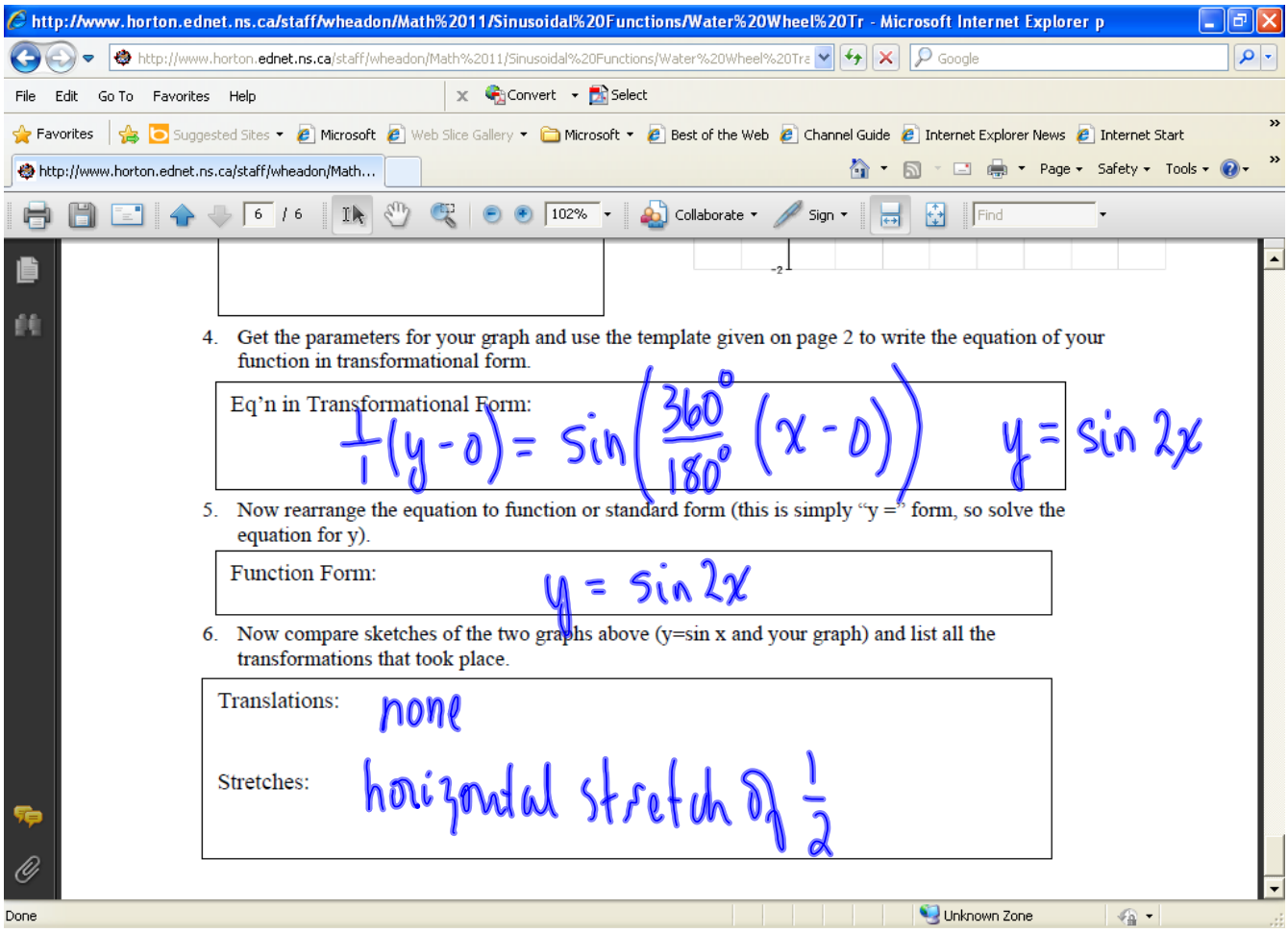
x- all $\frac{1}{2}$ of the original

y - no change

4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.

Done Unknown Zone

CASE 4 (cont



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4. Get the parameters for your graph and use the template given on page 2 to write the equation of your function in transformational form.

Eq'n in Transformational Form: $\frac{1}{1}(y-0) = \sin\left(\frac{360^\circ}{180^\circ}(x-0)\right)$ $y = \sin 2x$

5. Now rearrange the equation to function or standard form (this is simply "y =" form, so solve the equation for y).

Function Form: $y = \sin 2x$

6. Now compare sketches of the two graphs above (y=sin x and your graph) and list all the transformations that took place.

Translations: none

Stretches: horizontal stretch of $\frac{1}{2}$

Transformational Form

$$\frac{1}{Amp}(y - SA) = \sin\left(\frac{360^\circ}{period}(x - PS)\right)$$

If $Amp \neq 1$, then there is a a vertical stretch.

$SA \neq 0$, then there is a vertical translation

$Period \neq 360^\circ$, then there is a horizontal stretch

$PS \neq 0$, then there is a horizontal translation

HW: p122/17a & b