Characteristics of Functions

1. Fully factor each of the following.

a) $60x^5 - 12x^3$

b) $x^2 - 3x - 10$

c) $3x^2 - 75y^2$

d) $6x^2 - 7x - 5$

2. Simplify each of the following, state restrictions:

a) $\dfrac{x^2 + 4x - 12}{x^2 - 4} \times \dfrac{x^2 + 4x + 4}{x + 6}$

b) $\dfrac{4x - 4}{x^2 - 1} + \dfrac{x + 7}{x^2 - 2x - 3}$

3. Simplify the following. Your answer must be in simplest form.

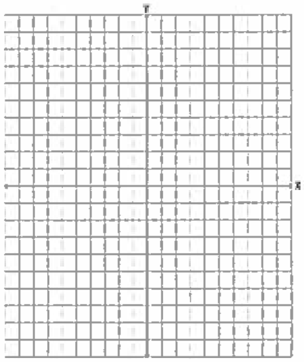
a) $\sqrt{18} + 3\sqrt{8} - 2\sqrt{50}$

b) $3\sqrt{2}(\sqrt{2} + 9\sqrt{11})$

c) $(\sqrt{3} - 4\sqrt{2})(\sqrt{3} + 4\sqrt{2})$

4. State the domain and range of the following functions. Provide a sketch of the given relation.

a) $y = -2(x-3)^2 - 3$

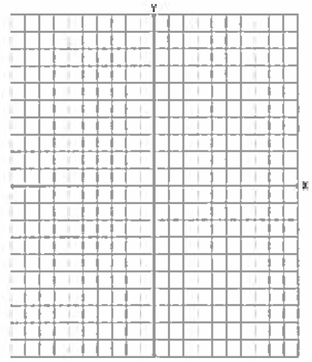


Domain ______________________

Range ______________________

Function? YES or NO (Circle one)

b) $y = \sqrt{x+3} - 1$



Domain ______________________

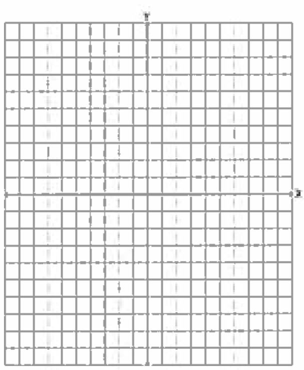
Range ______________________

Function? YES or NO (Circle one)

5. Determine the coordinates of the intersection point(s) for the following system of equations.

$$y = x^2 - 6x + 1$$

$$y = x - 5$$



6. The following transformations are applied to f(x)

- Stretch vertically by a factor of 8
- Stretch horizontally by a factor of 4
- Reflect in the y-axis.
- Translate 2 units left and 1 unit up

Write g(x) with its transformations.

State the mapping rule

7. Describe, ***in the appropriate order***, the transformations (example: HS by 4) that must be applied to the base function, f(x) = $\sqrt{x}$, to obtain the transformed function g(x).

$$g(x) = \frac{1}{3}\sqrt{2x-2} + 11$$

8. A rocket is shot from a lighthouse. The height, h, in metres, after t seconds is given by $h(t) = -3t^2 + 18t + 21$.

a) What is the height of the launching pad?

b) What is the maximum height reached by the rocket?

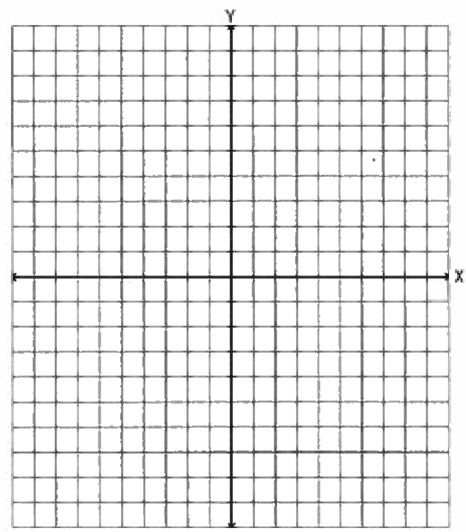
c) At what time is the maximum height reached?

d) When does the rocket hit the ground?

e) State the domain and range for this application

9. Find the inverse of the relation $f(x) = 2x^2 + 4x - 2$.

10.a) Given $f(x) = (x+1)^2 - 3,$

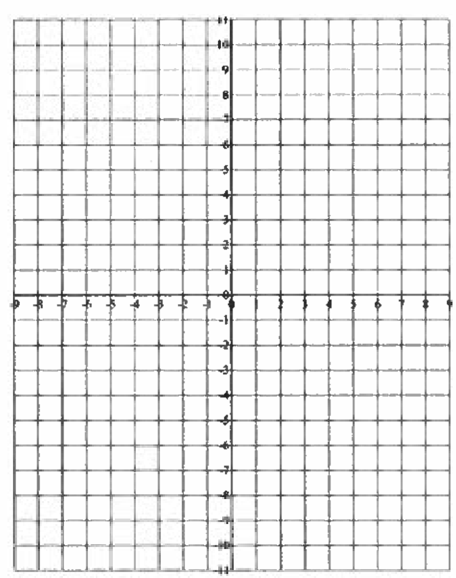


b) Graph f(x) and $f^{-1}(x)$

c) Determine the equation of $f^{-1}(x)$

11. Given the table of values of f(x), sketch the graph of $g(x) = -3f(2(x-1)).+4$

Points on f(x)	Mapping Rule, new points
(-5,0)	
(-3,2)	
(0,2)	
(1,-1)	
(2,1)	



MCR 3U1 **Exam Review**

Exponential Functions

1. Evaluate each of the following. **Show steps** to show your use of the exponent laws

a) $(-5)^2$ b) $\frac{5^{-1}}{3^{-2}}$ c) $(6^{-2})^2$ d) $16^{\frac{3}{4}}$

2. Simplify each of the following. Show steps and your answer should have positive exponents only.

a) $\dfrac{x^{\frac{2}{5}} \bullet x^{\frac{7}{10}}}{x^{\frac{1}{4}}}$ b) $(100x)^{\frac{1}{2}} \div (27x^{-2})^{\frac{2}{3}}$

3. Verify that the tables represent exponential relationships. Find an equation for each set of data.

i)

x	y
0	-2
1	-10
2	-50
3	-250

ii)

x	y
-1	16
0	8
1	4
2	2

4. The value of a car after it is purchased depreciates according to the formula $V(n) = 26500(0.77)^n$ where $V(n)$ is the car's value after a number of years, n.

a) What is the purchase price of the car?

b) What is the annual rate of depreciation?

c) What is the car's value at the end of 2 years?

5. A city has 2 million people living in it in 2005. It experienced an average growth in the population of 8.5% per year.

a) Write an equation that models the population, P, in millions, of this country as a function of the number of years, n, since 2005.

b) What is the city population in 2027?

c) Use your equation to determine when the population will double from 2005.

6. A 7-g sample of radioactive plutonium has a half-life of 41 days.

a) State an equation to represent the amount of plutonium, A, in grams, that remains after t days.

b) Determine that amount that remains after 90 days.

Trigonometric Functions

1. Determine each exact value. **Show all of your steps.** (no calculators – use special triangles)

a) $\cos 120°$

b) $\cot 225°$

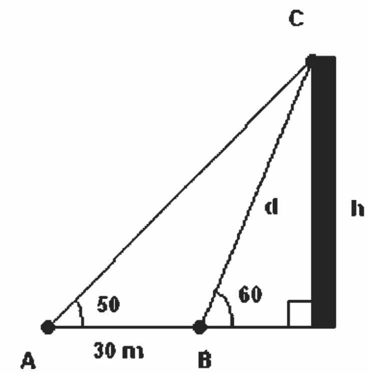
2. Solve for *two* values of θ to the nearest degree where $0° \leq \theta \leq 360°$.

a) $\cos \theta = -0.1683$

c) $\sec \theta = \sqrt{2}$

3. A is an angle in standard position. P(3, -4) is a point on the terminal arm of θ. Determine the sin and cot ratios for the angle.

4. Find d and h, showing all your work.



5. In $\triangle ABC$, $\angle C$ = 50°, c = 3.1 cm and b = 3.6 cm. Solve for the ***two possible*** values for $\angle B$. Include diagrams in your answer. (ambiguous case)

6. Prove the identity $\cos x(\csc x + \tan x) = \cot x + \sin x$

7. The graph of the function $y = \sin x$ is transformed as described below.
   - Stretch the graph horizontally by a factor of 5.
   - Stretch the graph vertically so the new amplitude of the graph is 3 times of the original amplitude.
   - Reflect the graph in the x axis.
   - Translate the graph 1 units up and shift the graph 45° to the right.

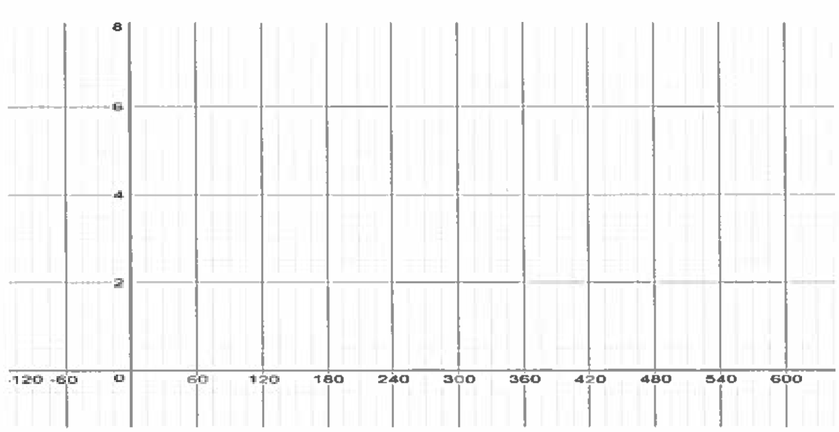
Determine an equation of the transformed function.

8. Complete the following chart for the given functions.

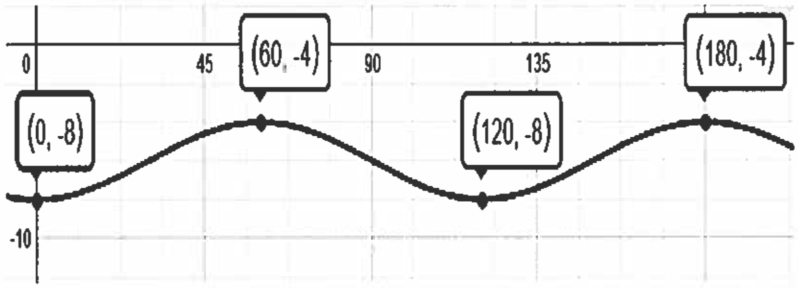
Equation	Amplitude	Period	Phase Shift	Vertical Translation
a) $y = -3\sin(\theta - 80°) - 6$				
b) $y = 0.5\cos 2\theta - 60^0 + 1$				

9. Sketch one cycle of $y = 4\sin 0.5(\theta + 90°) + 3$

Key points	Mapping Rule:



10. Find two possible equations (**one Sine and one Cosine**) for the given function.



11. The blue seat on a ferris wheel begins at the top of the ride is at the height h, in m, at a time in t seconds that follows the equation. $h(t) = -11 \sin(10t) + 12$

Sketch the graph

a) Max. height

b) Min. height

c) Time for one rotation

d) Radius of the wheel

e) when the blue seat is at a maxiumum

Discrete Functions

1. Find the general term of the sequence 0, 12, 24....

2. Find the general term of 3, -3/2, 3/4, ...

3. For the arithmetic series -6 - 1 + 4 ...139 , determine S_n.

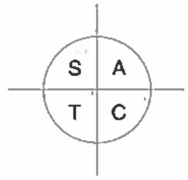
4. For the geometric series 8+32+128 ....., determine S_5.

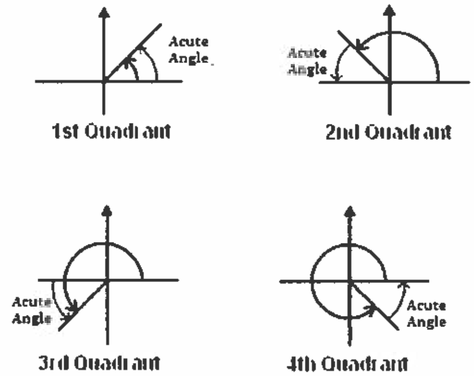
5. What is the final amount if you invest $4444 at 5.3% p/a , compounded quarterly, for 11 years?

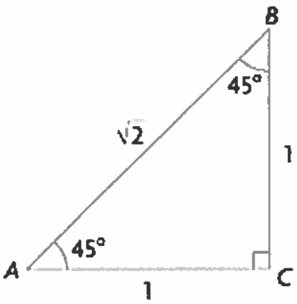
6. How much do you need to invest today so that it grows to $155000 in 30 years? (5.2% interest per annum, compounded monthly)

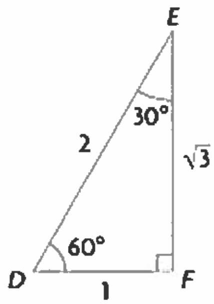
FORMULA PAGE

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$









Identities Based on Definitions	Identities Derived from Relationships	
Reciprocal Identities	**Quotient Identities**	**Pythagorean Identities**
$\csc\theta = \frac{1}{\sin\theta}$, where $\sin\theta \neq 0$	$\tan\theta = \frac{\sin\theta}{\cos\theta}$, where $\cos\theta \neq 0$	$\sin^2\theta + \cos^2\theta = 1$
$\sec\theta = \frac{1}{\cos\theta}$, where $\cos\theta \neq 0$	$\cot\theta = \frac{\cos\theta}{\sin\theta}$, where $\sin\theta \neq 0$	$1 + \tan^2\theta = \sec^2\theta$
$\cot\theta = \frac{1}{\tan\theta}$, where $\tan\theta \neq 0$		$1 + \cot^2\theta = \csc^2\theta$

Finding sides: $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ $\qquad a^2 = b^2 + c^2 - 2bc\cos A$

Finding angles: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ $\qquad \cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Right triangles: SOHCAHTOA $\qquad \sin\theta = \frac{y}{r} \qquad \cos\theta = \frac{x}{r} \qquad \tan\theta = \frac{y}{x}$

$t_n = a + d(n-1)$ $\qquad S_n = \frac{n}{2}[2a + d(n-1)]$ $\qquad S_n = \frac{n}{2}(a + t_n)$

$t_n = ar^{n-1}$ $\qquad S_n = \frac{a(r^n - 1)}{r - 1}$ $\qquad S_n = \frac{t_n \times r - a}{r - 1}$

$A = P(1+i)^n$ $\qquad P = A(1+i)^{-n}$

Key.

MCR 3U1 **Exam Review**

Characteristics of Functions

1. Fully factor each of the following.

a) $60x^5 - 12x^3$

$= 12x^3(5x^2 - 1)$

b) $x^2 - 3x - 10$

$= (x-5)(x+2)$

c) $3x^2 - 75y^2$

$= 3(x^2 - 25y^2)$

$= 3(x+5y)(x-5y)$

d) $6x^2 - 7x - 5$

$= (3x-5)(2x+1)$

$6x^2$	$-6x$
$3x$	-5

2. Simplify each of the following, state restrictions:

a) $\dfrac{x^2+4x-12}{x^2-4} \times \dfrac{x^2+4x+4}{x+6}$

$= \dfrac{(x+6)(x-2)}{(x+2)(x-2)} \times \dfrac{(x+2)(x+2)}{(x+6)}$

$= x + 2, \quad x \neq \pm 2, -6$

b) $\dfrac{4x-4}{x^2-1} + \dfrac{x+7}{x^2-2x-3}$

$= \dfrac{4\cancel{(x-1)}}{(x+1)\cancel{(x-1)}} + \dfrac{(x+7)}{(x-3)(x+1)}$

$= \dfrac{4}{x+1} + \dfrac{(x+7)}{(x-3)(x+1)}$

$= \dfrac{4(x-3) + x + 7}{(x-3)(x+1)}$

$x \neq \pm 1, 3$

$= \dfrac{4x - 12 + x + 7}{(x-3)(x+1)} = \dfrac{5x-5}{(x-3)(x+1)}$

3. Simplify the following. Your answer must be in simplest form.

a) $\sqrt{18} + 3\sqrt{8} - 2\sqrt{50}$

$= \sqrt{9}\sqrt{2} + 3\sqrt{4}\sqrt{2} - 2\sqrt{25}\sqrt{2}$

$= 3\sqrt{2} + 6\sqrt{2} - 10\sqrt{2}$

$= -\sqrt{2}$

b) $3\sqrt{2}(\sqrt{2} + 9\sqrt{11})$

$= 3\sqrt{4} + 27\sqrt{22}$

$= 6 + 27\sqrt{22}$

c) $(\sqrt{3} - 4\sqrt{2})(\sqrt{3} + 4\sqrt{2})$

$= \sqrt{9} + 4\sqrt{6} - 4\sqrt{6} - 16\sqrt{4}$

$= 3 - 16(2)$

$= 3 - 32$

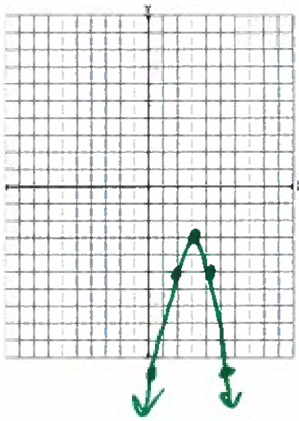
$= -29$

4. State the domain and range of the following functions. Provide a sketch of the given relation.

a) $y = -2(x-3)^2 - 3$ $V(3,-3)$

step x -2

$-2, -6, -10 \ldots$



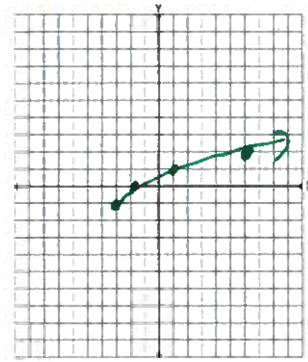
Domain $\{x \in \mathbb{R}\}$

Range $\{y \in \mathbb{R}, y \le -3\}$

Function? YES or NO (Circle one)

b) $y = \sqrt{x+3} - 1$

$\sqrt{x}$	$(x-3, y-1)$
$(0,0)$	$(-3,-1)$
$(1,1)$	$(-2,0)$
$(4,2)$	$(+1,1)$
$(9,3)$	$(6,2)$



Domain $\{x \in \mathbb{R}, x \ge -3\}$

Range $\{y \in \mathbb{R}, y \ge -1\}$

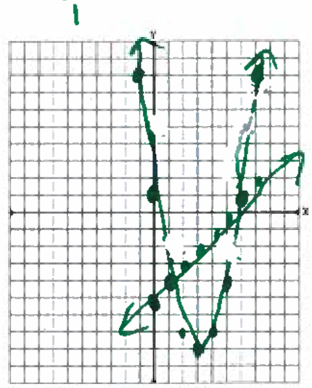
Function? YES or NO (Circle one)

5. Determine the coordinates of the intersection point(s) for the following system of equations.

$y = x^2 - 6x + 1 \rightarrow x^2 - 6x + 9 - 9 + 1$

$(x-3)^2 - 8$

$y = \frac{1}{1}x - 5$



POIs are $(6,1)$ and $(1,-4)$

$x^2 - 6x + 1 = x - 5$

$x^2 - 7x + 6 = 0$

$(x-6)(x-1) = 0$

$x = 6$ $\quad x = 1$

$y = 6 - 5$ $\quad y = 1 - 5$

$y = 1$ $\quad y = -4$

6. The following transformations are applied to f(x)

- Stretch vertically by a factor of 8
- Stretch horizontally by a factor of 4
- Reflect in the y-axis.
- Translate 2 units left and 1 unit up

Write g(x) with its transformations.

$g(x) = 8f\left[-\frac{1}{4}(x+2)\right] + 1$

State the mapping rule

$(x,y) \rightarrow (-4x-2, 8y+1)$

7. Describe, ***in the appropriate order***, the transformations (example: HS by 4) that must be applied to the base function, f(x) = $\sqrt{x}$, to obtain the transformed function g(x).

$$g(x) = \frac{1}{3}\sqrt{2x-2} + 11$$

Factor k $\sqrt{2(x-1)}$

VC $\times \frac{1}{3}$

HC $\times \frac{1}{2}$

H.T. 1 right

V.T. 11 up

8. A rocket is shot from a lighthouse. The height, h, in metres, after t seconds is given by h(t) = -3t² + 18t + 21.

a) What is the height of the launching pad?

$h(0) = 21$ metres

b) What is the maximum height reached by the rocket?

$h(t) = -3(t^2-6t)+21$
$= -3(t^2-6t+9-9)+21$
$= -3(t-3)^2 + 27 + 21$
$= -3(t-3)^2 + 48$

$\therefore$ max height is 48 m

OR
$-3t(t-6)$
$t=0 \quad t=6$
$t_v = 3$
$h(3) = -3(3)^2+18(3)+21$
$h(3) = 48$

c) At what time is the maximum height reached?

3 seconds

d) When does the rocket hit the ground?

$0 = -3(t^2-6t-7)$
$0 = -3(t-7)(t+1)$
$t = 7 \qquad t = -1$

$\therefore$ it hits the ground @ 7 seconds.

OR
use quad. formula
$t = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

e) State the domain and range for this application

D: $\{t \in \mathbb{R},\ 0 \le t \le 7\}$

R: $\{h \in \mathbb{R},\ 0 \le h \le 48\}$

9. Find the inverse of the relation $f(x) = 2x^2 + 4x - 2$.

$y = 2(x^2 + 2x + 1 - 1) - 2$

$y = 2(x+1)^2 - 4$

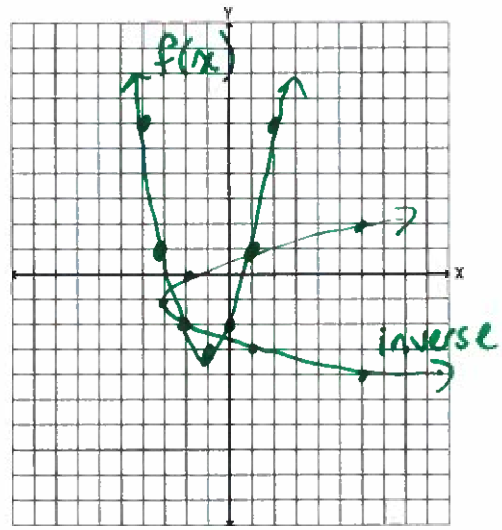
$x = 2(y+1)^2 - 4$

$\frac{x+4}{2} = (y+1)^2$

$\pm\sqrt{\frac{x+4}{2}} = y + 1$

$\rightarrow y = \pm\sqrt{\frac{x+4}{2}} - 1$

10.a) Given $f(x) = (x+1)^2 - 3$, vertex $(-1,-3)$



b) Graph f(x) and $f^{-1}(x)$

c) Determine the equation of $f^{-1}(x)$

$y = (x+1)^2 - 3$

$x = (y+1)^2 - 3$

$x + 3 = (y+1)^2$

$\pm\sqrt{x+3} = y + 1$

$\rightarrow y = \pm\sqrt{x+3} - 1$

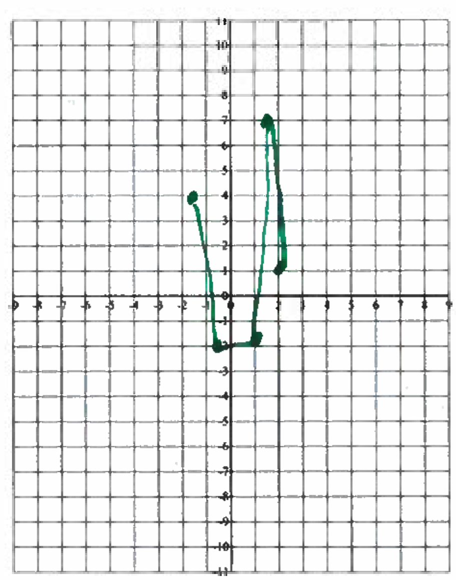
$(-1,-3) \rightarrow (-3,-1)$

$(-2,-2) \rightarrow (-2,-2)$

$(0,-2) \rightarrow (-2,0)$

11. Given the table of values of f(x), sketch the graph of $g(x) = -3f(2(x-1)) + 4$

Points on f(x)	**Mapping Rule and new points**
$(x, y) \rightarrow$	$\left(\frac{x}{2} + 1, -3y + 4\right)$
(-5,0) $\rightarrow$	(-1.5, 4)
(-3,2) $\rightarrow$	(-0.5, -2)
(0,2) $\rightarrow$	(1, -2)
(1,-1) $\rightarrow$	(1.5, 7)
(2,1) $\rightarrow$	(2, 1)



Exponential Functions

1. Evaluate each of the following. **Show steps** to show your use of the exponent laws

a) $(-5)^2$ b) $\frac{5^{-1}}{3^{-2}}$ c) $(6^{-2})^2$ d) $16^{\frac{3}{4}}$

$= 25$

$= \frac{3^2}{5}$

$= 9/5$

$= 6^{-4}$

$= \frac{1}{1296}$

$= \sqrt[4]{16}^{\,3}$

$= 2^3$

$= 8$

2. Simplify each of the following. Show steps and your answer should have positive exponents only.

a) $\frac{x^{\frac{2}{5}} \bullet x^{\frac{7}{10}}}{x^{\frac{1}{4}}}$

$= \frac{x^{4/10} x^{7/10}}{x^{1/4}}$

$= \frac{x^{11/10}}{x^{1/4}}$

$= \frac{x^{22/20}}{x^{5/20}}$

$= x^{17/20}$

b) $(100x)^{\frac{1}{2}} \div (27x^{-2})^{\frac{2}{3}}$

$= \frac{\sqrt{100}\, x^{1/2}}{\sqrt[3]{27}^{\,2}\, x^{-4/3}}$

$= \frac{10\, x^{3/6}}{9\, x^{-8/6}}$

$= \frac{10}{9} x^{11/6}$

3. Verify that the tables represent exponential relationships. Find an equation for each set of data.

i)

x	y
0	-2
1	-10
2	-50
3	-250

Common ratio

÷ 5

÷ 5

÷ 5

$y = -2(5)^x$

ii)

x	y
-1	16
0	8
1	4
2	2

common ratio

÷ 1/2

÷ 1/2

÷ 1/2

$y = 8(\frac{1}{2})^x$

4. The value of a car after it is purchased depreciates according to the formula $V(n) = 26500(0.77)^n$ where $V(n)$ is the car's value after a number of years, n.

a) What is the purchase price of the car?

$V(0) = 26500(0.77)^0$

$= \$26500$

b) What is the annual rate of depreciation?

$1 - 0.77 = 0.23$

rate is 23% depreciation

c) What is the car's value at the end of 2 years?

$V(2) = 26500(0.77)^2$

$= \$15\,711.85$

5. A city has 2 million people living in it in 2005. It experienced an average growth in the population of 8.5% per year.

a) Write an equation that models the population, P, in millions, of this country as a function of the number of years, n, since 2005.

$P(n) = 2(1.085)^n$

b) What is the city population in 2027?

$P(22) = 2(1.085)^{22}$

12 million people in 2027

c) Use your equation to determine when the population will double from 2005.

$4 = 2(1.085)^n$

$2 = 1.085^n$

$\log 2 / \log 1.085$ $n = 8.5$ years.

∴ It will be double in 2013

6. A 7-g sample of radioactive plutonium has a half-life of 41 days.

a) State an equation to represent the amount of plutonium, A, in grams, that remains after t days.

$A = 7\left(\frac{1}{2}\right)^{t/41}$

b) Determine that amount that remains after 90 days.

$A = 7(1/2)^{90/41}$

$= 1.5$

1.5g after 90 days

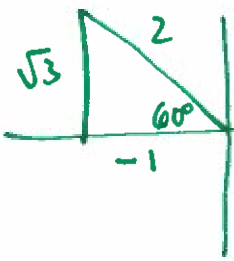
MCR 3U1 **Exam Review**

Trigonometric Functions

S | A
T | C

1. Determine each exact value. **Show all of your steps.** (no calculators – use special triangles)

a) cos 120°



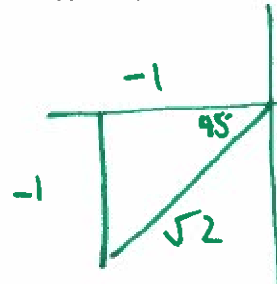
$\cos 60^\circ = \frac{1}{2}$

$\cos 120^\circ = -\frac{1}{2}$

$\cos\theta = adj/hyp$

$\cos 120^\circ = -1/2$

b) cot 225°



$\tan 45^\circ = 1/1$

$\tan 225^\circ = 1/1$

$\cot 225 = 1$

$\cot\theta = adj/opp$

$\cot\theta = -1/-1 = 1$

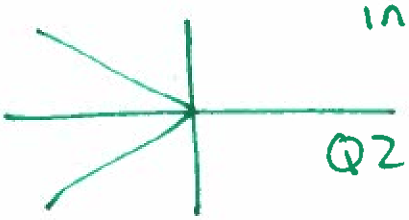
2. Solve for *two* values of θ to the nearest degree where 0° ≤ θ ≤ 360°.

a) cos θ = -0.1683

$\alpha = \cos^{-1}(0.1683)$

$\alpha = 80^\circ$

cosθ is neg. in Q2 + 3



Q2 $\theta = 180 - 80$
$= 100^\circ$

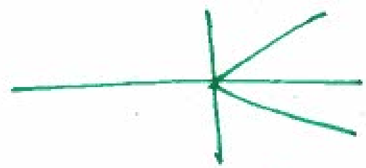
Q3 $\theta = 180 + 80 = 260^\circ$

c) sec θ = $\sqrt{2}$

$\cos\theta = \frac{1}{\sqrt{2}}$

special triangles $\alpha = 45^\circ$

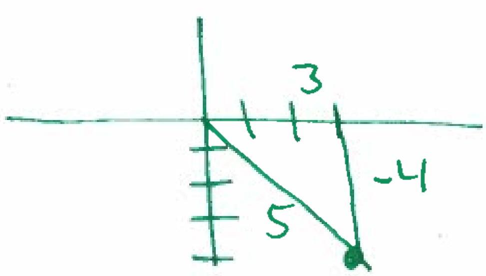
cosθ is pos in Q 1+4



Q1
$\theta = 45^\circ$

Q4: $\theta = 360 - 45$
$\theta = 315^\circ$

3. A is an angle in standard position. P(3, -4) is a point on the terminal arm of θ. Determine the sin and cot ratios for the angle.



$\sin\theta = \frac{-4}{5}$

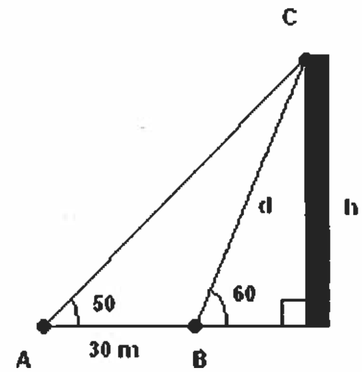
$\tan\theta = \frac{-4}{3} \rightarrow \cot\theta = -\frac{3}{4}$

$3^2 + 4^2 = r^2$

$25 = r^2$

$5 = r$

4. Find d and h, showing all your work.



$$\frac{\sin 50^\circ}{d} = \frac{\sin 10^\circ}{30}$$

$$\frac{d}{\sin 50^\circ} = \frac{30}{\sin 10^\circ}$$

$$d = \frac{30 \sin 50^\circ}{\sin 10^\circ}$$

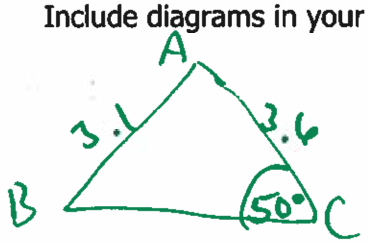
$$d = 132.3$$

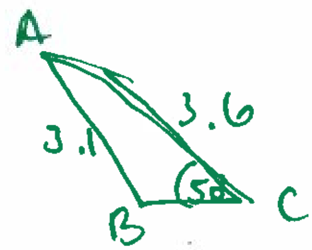
$\sin 60 = \text{opp}/\text{hyp}$

$\sin 60 = h/132.3$

$\boxed{h = 114.6\text{m}}$

5. In $\triangle ABC$, $\angle C = 50°$, c = 3.1 cm and b = 3.6 cm. Solve for the ***two possible*** values for $\angle B$. Include diagrams in your answer. (ambiguous case)





$$\frac{\sin B}{3.6} = \frac{\sin 50}{3.1}$$

$$B = 63^\circ$$

$\angle B$ is in Q2

$B = 180 - 63^\circ$

$B = 117^\circ$

6. Prove the identity $\cos x(\csc x + \tan x) = \cot x + \sin x$

LS

$\cos x(\csc x + \tan x)$

$= \cos x \csc x + \cos x \tan x$

$= \cos x \left(\frac{1}{\sin x}\right) + \cos x \left(\frac{\sin x}{\cos x}\right)$ RI, QI

$= \cot x + \sin x$ QI

RS

$\cot x + \sin x$

LS = RS

So identity is true.

7. The graph of the function $y = \sin x$ is transformed as described below.
- Stretch the graph horizontally by a factor of 5.
- Stretch the graph vertically so the new amplitude of the graph is 3 times of the original amplitude.
- Reflect the graph in the x axis.
- Translate the graph 1 units up and shift the graph 45° to the right.

Determine an equation of the transformed function.

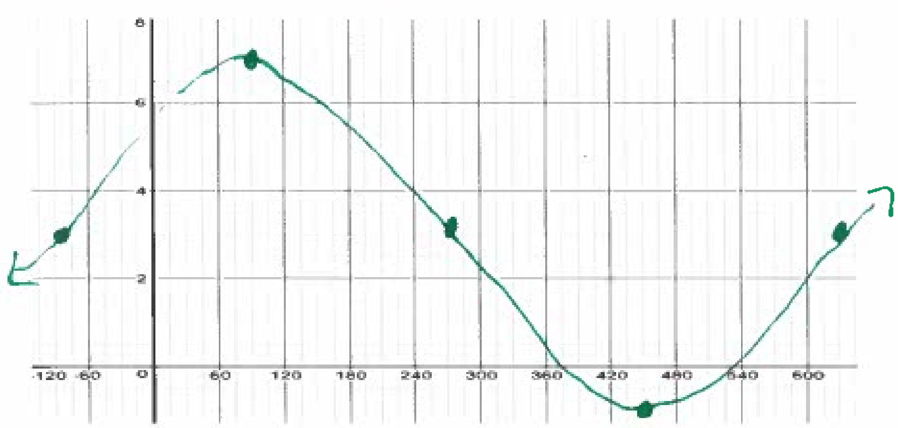
$y = -3\sin\left[\frac{1}{5}(x - 45°)\right] + 1$

8. Complete the following chart for the given functions.

Equation	Amplitude	Period	Phase Shift	Vertical Translation
a) $y = -3\sin(\theta - 80°) - 6$	3	360°	80° right	6 down
b) $y = 0.5\cos 2\theta - 60^0 + 1$ $2(\theta - 30)$	0.5	180°	30° right	1 up.

9. Sketch one cycle of $y = 4\sin 0.5(\theta + 90°) + 3$

Key points	$(2x - 90,\ 4y + 3)$
(0,0) →	(−90, 3)
(90,1) →	(90, 7)
(180,0) →	(270, 3)
(270,−1) →	(450, −1)
(360,0) →	(630, 3)

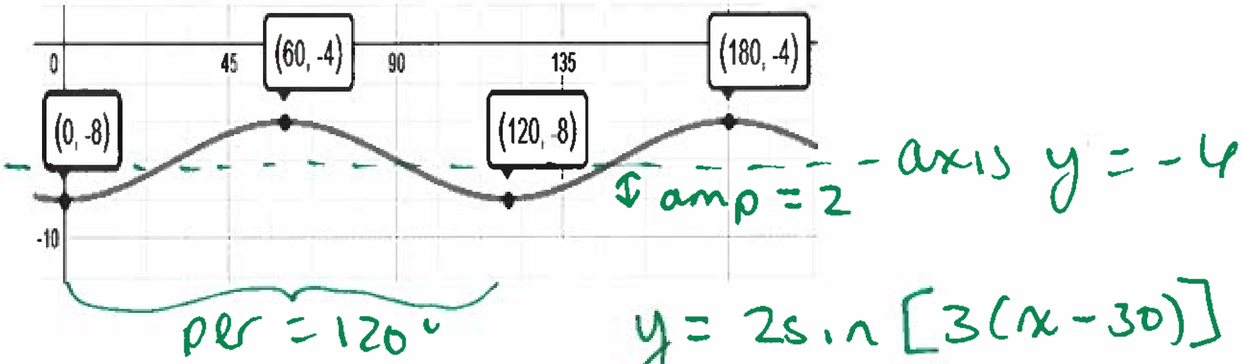


amp = 4

per. = 720°

axis y = 3

10. Find two possible equations (**one Sine and one Cosine**) for the given function.



$k = \frac{360}{120} = 3$

$y = 2\sin[3(x-30)] - 6$

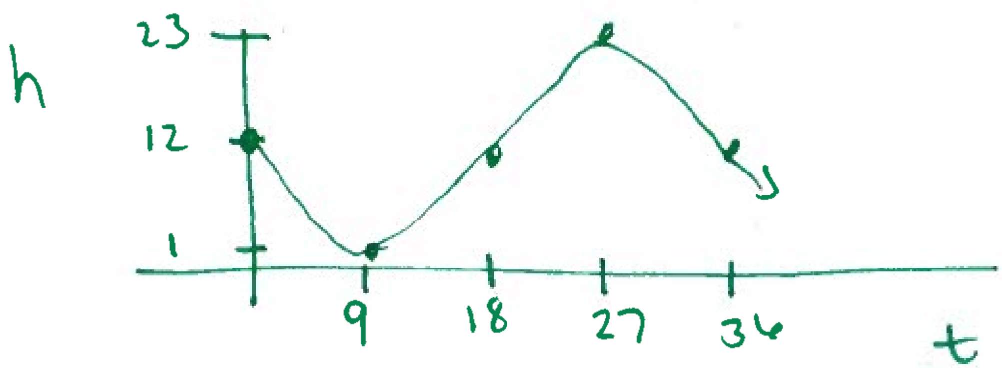
$y = 2\cos[3(x-60)] - 6$

or $y = -2\cos(3x) - 6$

11. The blue seat on a ferris wheel begins at the top of the ride is at the height h, in m, at a time in t seconds that follows the equation. h(t) = -11 sin 10t + 12

Sketch the graph

$(x, y) \rightarrow \left(\frac{x}{10}, -11y + 12\right)$



a) Max. height

23 m

b) Min. height

1 m

c) Time for one rotation

36 s

d) Radius of the wheel

11 m

e) when the blue seat is at a maxiumum

27 s.

Discrete Functions

1. Find the general term of the sequence 0, 12, 24....

$t_n = a + d(n-1)$
$= 0 + 12(n-1)$

$t_n = 12n - 12$

2. Find the general term of 3, -3/2, 3/4, ...

$t_n = ar^{n-1}$
$t_n = 3(-1/2)^{n-1}$

$r = -\frac{3}{2} \div 3$
$= -\frac{3}{2} \times \frac{1}{3}$
$= -3/6 = -1/2$

3. For the arithmetic series -6 - 1 + 4 ...139 , determine S_n.

$t_n = a + (n-1)d$
$139 = -6 + (n-1)(5)$
$139 = -6 + 5n - 5$
$150 = 5n$
$30 = n$

$S_{30} = \frac{30}{2}[2(-6) + (30-1)(5)]$
$S_{30} = 15(-12 + 145)$
$= 15(133)$
$S_{30} = 1995$

4. For the geometric series 8+32+128 ....., determine S_5.

$S_5 = \frac{8(4^5-1)}{4-1}$

$S_n = \frac{a(r^n-1)}{r-1}$

$S_5 = \frac{8(1023)}{3}$

$S_5 = 2728$

5. What is the final amount if you invest $4444 at 5.3% p/a , compounded quarterly, for 11 years?

$A = 4444\left(1 + \frac{0.053}{4}\right)^{44}$
$A = \$7930.58$

∴ Final amount is $7930.58

6. How much do you need to invest today so that it grows to $155000 in 30 years? (5.2% interest per annum, compounded monthly)

$P = 155\,000\left(1 + \frac{0.052}{12}\right)^{-360}$

$P = 32681.05$

∴ Invest $32 681.05 today.