MCR 3U Review Questions for Practice

Algebraic Concepts of Functions

1. Simplify. If necessary, state restrictions on the variables.

$\frac{3x+6}{7x-7}\times\frac{14x-14}{5x+10}$	$\frac{a-1}{2a-3}\div\frac{1-a}{4a-6}$	$\frac{\frac{x+y}{2x-y}}{\frac{x+y}{2x+y}}$	$\frac{2}{x^2-x-12}+\frac{5}{x^2+8x+15}$
$5\sqrt{3}\times 3\sqrt{4a^2}$	$\frac{\sqrt{27}}{18}$	$\left(\frac{36}{25}\right)^{-\frac{3}{2}}$	$2\sqrt{13}(3-\sqrt{13})$

2. Find the minimum or maximum value of the function and the value of *x* where it occurs.

a) $y=x^2+2x+3$	**b)** $y=8x-20+x^2$	**c)** $y=\frac{1}{2}x^2-4x+8$	**d)** $y=12x^2-17x-5$

3. Solve by completing the square. Express solutions in simplest radical form.

a) $2x^2+8x+5=0$	**b)** $3x^2-6x+2=0$	**c)** $0.5x^2+0.4x-2=0$

4. Solve by factoring.

a) $x^2-9x+18=0$	**b)** $x^2-4x=77$	**c)** $x^2-40=3x$	**d)** $2x^2-5x-12=0$

5. Solve using the quadratic formula.

a) $x^2-2x-5=0$	**b)** $-x^2-5x-1=0$	**c)** $0=2-2x-5x^2$	**d)** $0.02x^2+0.15x-0.3=0$

6. Determine the point(s) of intersection for each linear-quadratic sytem.

a) $y=x^2+4x+3$, $y=5x+9$	**b)** $y=-x^2-4x+6$, $y=x-8$	**c)** $y=6x^2-4x-25$, $y=3x-5$

7. The temperature of a cooling liquid over time can be modeled by the exponential function $T(x)=55\left(\frac{1}{2}\right)^{\frac{x}{20}}$

   where $T(x)$ is the temperature, in degrees Celsius, and x is the elapsed time, in minutes.
   a. What was the initial temperature of the liquid?
   b. How long does it take for the temperature to reach ½ its original temperature?
   c. What is the horizontal asymptote of this function?
   d. State any restrictions on the domain and range.
   e. Determine how long it takes for the temperature to reach 35˚C.

8. A bacteria culture doubles in size every 15 minutes. How long will it take for a culture of 20 bacteria to grow to a population of 163840?

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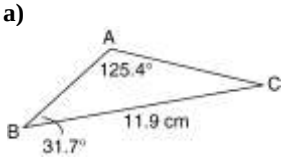
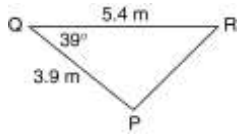
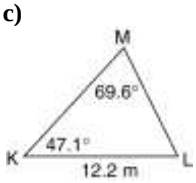
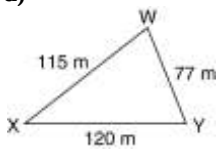
9. A tennis ball is dropped from a height of 10m. Each time the ball touches the ground, it bounces up to about 45% of the maximum height of the previous bounce. Determine the height after 5 bounces.

10. Solve each triangle. Round each calculated value to the nearest tenth of a unit, if necessary.

a)	**b)**	**c)**	**d)**
			

11. The point (-3,-7) is on the terminal arm of an angle θ in standard position. Make a sketch of the angle and find exact values for the ratios of $\sin\theta$, $\cos\theta$, and $\tan\theta$.

12. Prove the identities

a) $\dfrac{\cos x \sin x}{\cot x} = 1 - \cos^2 x$	**b)** $\sec^2 x = 1 + \tan^2 x$	**c)** $\cot x \sec x = \sin x$

13. Find the period, in degrees, for each of the following.

a) $y = 3\sin x$	**b)** $y = \cos 3x$	**c)** $y = \sin\dfrac{3x}{4}$	**d)** $y = 3\sin 4x$

14. State the amplitude of each function.

a) $y = \sin x$	**b)** $y = 6\sin\dfrac{2\theta}{3}$	**c)** $y = \dfrac{1}{4}\cos 0.6\theta$	**d)** $y = 3\cos\dfrac{1}{2}\theta$	**e)** $y = -2\sin\theta$

15. Find the angle to the nearest degree

i) $\sin A = \dfrac{\sqrt{3}}{2}$	**j)** $\cos A = -\dfrac{1}{2}$	**k)** $\sin\theta = \dfrac{1}{2}$	**l)** $\cos\theta = -\dfrac{1}{\sqrt{2}}$

16. Find the formula for the nth term also the values for the indicated terms for each sequence.

5, 13, 21, … ; t_{19} and t_{57}	3, 6, 12, … ; t_7 and t_{11}	$t_7 = -11$ and $t_{13} = -29$; t_2	t_7 = 0.23 and t_{10} = 230; t_{14}

17. Find the number of terms in each of the following sequences.

7, 14, 21, … , 161	8, 12, 18, … , 40.5	–3, 3, 9, … , 321	567, 189, 63, …, $\dfrac{7}{27}$

18. Find the sum of each series

$-4+1+6+\cdots+91$	S_{32} for 6 + 7.4 + 8.8 + …	$16+10+4+\cdots-50$	S_9 for $5+10+20+\cdots$

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Identifying Functions & Properties of Functions

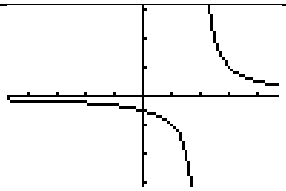
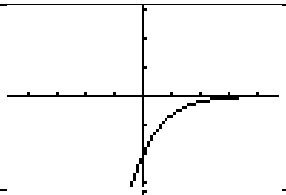
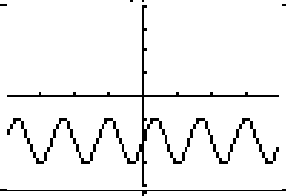
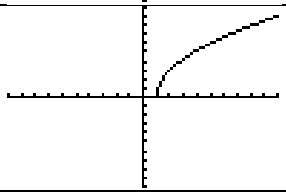
1. Match each equation to one of the graphs shown below. Give reasons for your choices (i.e How do you know that you have matched the each equation with its graph?)

   a. $y = 3\sqrt{x-1}$

   b. $y = -2\left(\frac{1}{3}\right)^x$

   c. $y = \sin 3x - 2$

   d. $y = \frac{1}{x-2}$

Graph	Equation	Reasons
		
		
		
		

2. Graph the following functions and identify the properties of the function (including transformations applied, domain/range, x- and y-intercepts, zeros, max/min, asymptotes, period, amplitude, etc)

$f(x) = \frac{1}{x}$	$f(x) = \sqrt{x}$	$f(x) = \sin x$	$f(x) = 2(5)^x$
$f(x) = \frac{1}{x-2}$	$f(x) = 3\sqrt{x} - 1$	$f(x) = 3\sin 2x$	$f(x) = 5(2)^x$
$f(x) = -\frac{3}{x}$	$f(x) = \sqrt{-x}$	$f(x) = 4\sin(x-90) + 2$	$f(x) = 5\left(\frac{1}{2}\right)^x$
$f(x) = \frac{1}{2x+8}$	$f(x) = -\sqrt{x+3}$	$f(x) = -\cos x + 5$	$f(x) = -5(2)^x + 1$