Unit 4- Review

1. State the intervals where the graph of $y = \sec(x), -2\pi \le x \le 2\pi$ is increasing.
2. Sketch the graphs of $y = \tan(x)$ and $y = \cot(x), -\frac{\pi}{2} \le x \le \pi$. Using the letters A,B and C, label the three intersections points of the two functions .Determine the area and perimeter of ΔABC.
3. Identify the amplitude, period, phase shift, and vertical displacement for each of the following:
   a) $y = 6\cos\left[12\left(x - 30^{\circ}\right)\right] + 3$
   b) $y = -2 + 3\sin\left(x + \frac{\pi}{4}\right)$
   c) $y = -4\cos\left(2x - \frac{\pi}{3}\right) - 2$
4. Sketch $y = 5\sin\left[\frac{3}{2}\left(x - 30^{\circ}\right)\right], -120^{\circ} \le x \le 120^{\circ}$.
5. Sketch one period of the function $f(x) = -\cos\left[\frac{1}{3}\left(x + \frac{5\pi}{6}\right)\right] - 2$.
6. Sketch one period of the function $f(x) = 3\cos\left(2x - 60^{\circ}\right) + 1$.
7. Sketch the graph of $y = -2\sin\left(\frac{x}{2} + \frac{\pi}{4}\right) + 3$.
8. a) Determine a sine function that is defined for all $x \ge 0$ and has its first minimum at $(\pi/3, 3)$ and its first maximum at $(4\pi/3, 9)$.

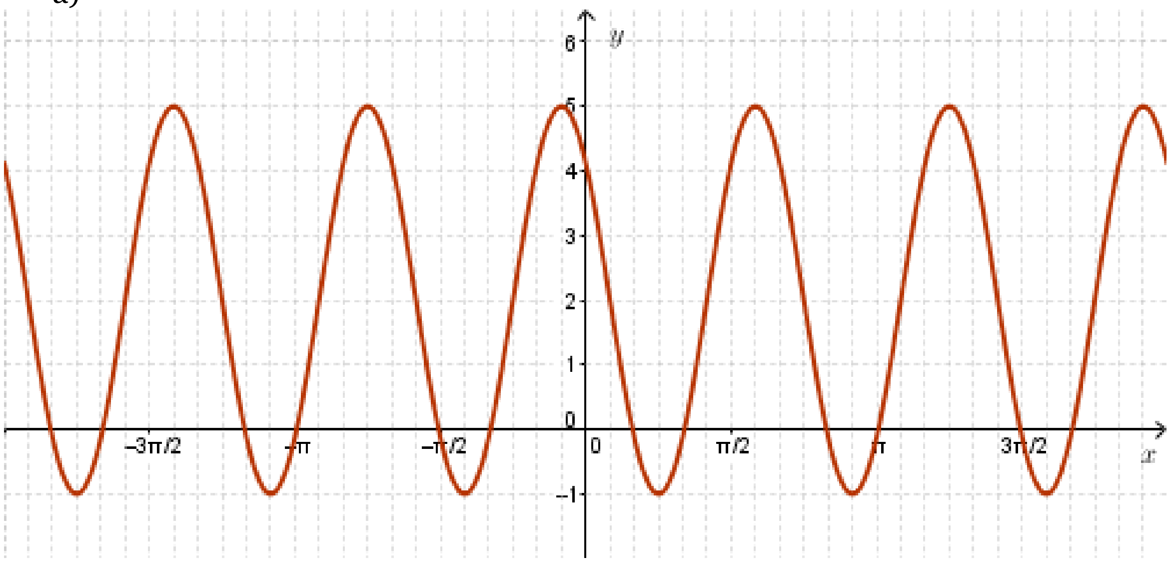
   b) State an equivalent cosine function for part a).

9. a) Determine a sinusoidal function f(x) that
   - has a maximum of 100;
   - has a minimum of 20;
   - a period of 30;
   - has the point (15,60) on its curve; and
   - for $x \ge 0$, reaches its first maximum before its first minimum.

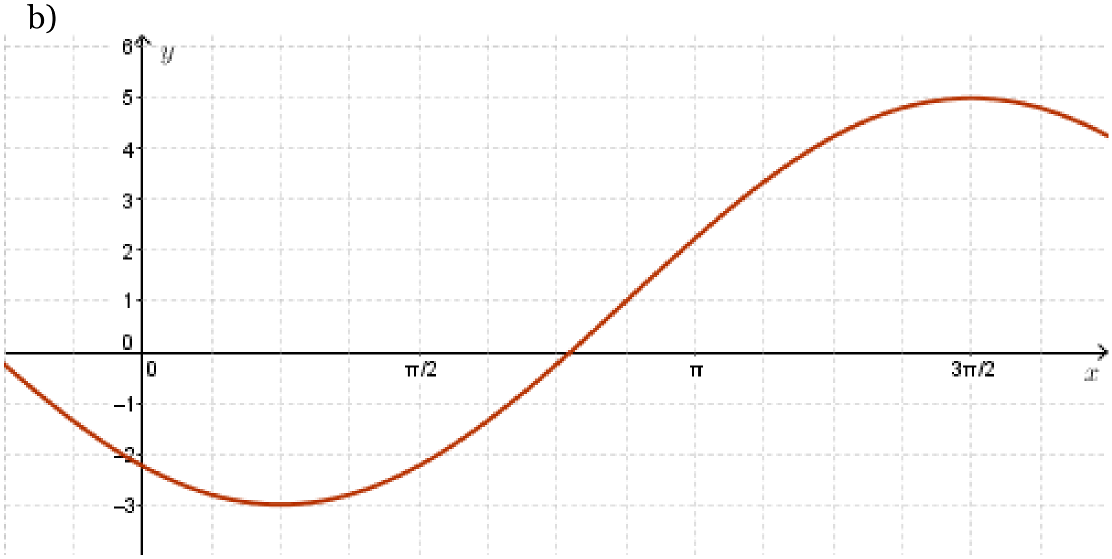
   b) Use your function from part a) to determine the first value of $x, x \ge 0$ such that $f(x)=80$.

10. Determine a sinusoidal function that could represent the graph drawn below.

a)



b)



11. For the function $y = -3\cos\left(2x + \frac{\pi}{2}\right) + 6$:

a) Graph four periods of the function for $x \geq 0$.

b) On your graph, sketch the line $y = \frac{15}{2}$.

c) Determine all solutions to $-3\cos\left(2x + \frac{\pi}{2}\right) + 6 = \frac{15}{2}$, in the interval $0 \leq x \leq 4\pi$.

d) Using the graph, verify that all of the solutions in the interval $0 \leq x \leq 4\pi$ have been determined in part c).

12. Ashley is riding a Ferris wheel that has a diameter of 40 metres. The wheel revolves at a rate of 1.5 revolutions per minute. If Ashley's height above the ground is shown by h after t minutes

   a) Find the equation of h(t).

   b) What is Ashley's maximum height above the ground while she is riding the Ferris wheel?

   c) If Ashley gets on the ride at its lowest point, how high above the ground will she be to start the ride?

   d) How many times does Ashley go around the Ferris wheel in four minutes?

   e) Draw a sketch of the rider's height above the ground at any time during the first four minutes.

   f) How long after she starts riding will her height be 31 metres above the ground?

   g) In the four minutes that she spends riding the Ferris wheel, what is the total amount of time that Ashley's height is above 31 metres?

13. The minimum depth, d (in metres), of water in a harbour, t hours after midnight, can be approximated by the function $d(t)=5\cos(0.5t)+12$, where $0 \le t \le 24$.

   a) Determine the maximum and minimum depths of water in the harbour.

   b) Determine the period of the depth function.

   c) What is the depth of water, to the nearest tenth of a metre, at 2:00 AM?

   d) A ship, which requires a minimum depth of 8.5 metres, is docked at midnight. By what time, to the nearest minute, must it leave in order to prevent being grounded?

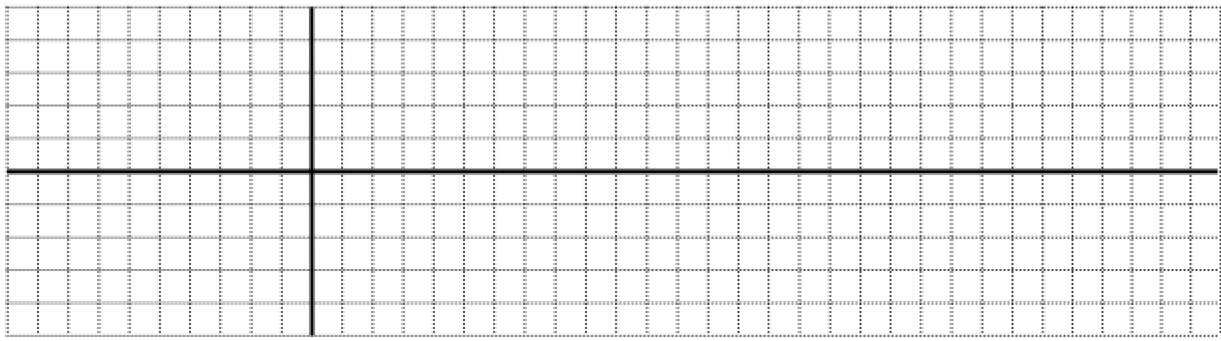
   e) What is the next time, to the nearest minute, that the ship can return to the harbour?

14. Determine the period and equation of vertical asymptotes of $y = -2\tan(50x)$.

15. The height of a rung on a hamster wheel can be modeled by $h(t) = -25\cos\left[2\pi\left(\frac{t-4}{12}\right)\right] + 27$, where ***h(t)*** represents the height of the rung above the bottom of the cage in centimeters and ***t*** is the time in seconds after the wheel starts moving. Show all your work for these questions.

   a) Determine the height of the rung at the start of the ride.
   b) Determine the maximum height of the rung during one rotation.
   c) How long will it take for the wheel to complete one full rotation?
   d) How long will it take for the wheel to reach its maximum height?
   e) Determine the average rate of change in the height of the rung between 2 and 3 seconds.

16. Graph one complete cycle of $y = 4\csc\left[\frac{\pi(t-1)}{2}\right]$.



17. Solve for x, $4\cos(x) - 3\sin(x) = 2 \quad (0 \leq x \leq 2\pi)$ (2 **DECIMAL PLACES**)

18. Solve for θ, $-10\cos^2(x) - 3\sin(x) + 9 = 0$, $(0 \leq x \leq 2\pi)$ (2 **DECIMAL PLACES**)

19. Find an **equation** of a function in the form $y = a\sin k(x-d) + c$ whose graph has a maximum at the point $A\left(\frac{\pi}{4}, 1\right)$ and a minimum at $B\left(\frac{5\pi}{4}, -1\right)$.

20. Graph $y = -2\sin\left(\frac{1}{2}\theta - \frac{\pi}{4}\right) + 3$, $-\pi \leq \theta \leq \pi$