MHF-4U QUIZ#11 (Application) [redacted]

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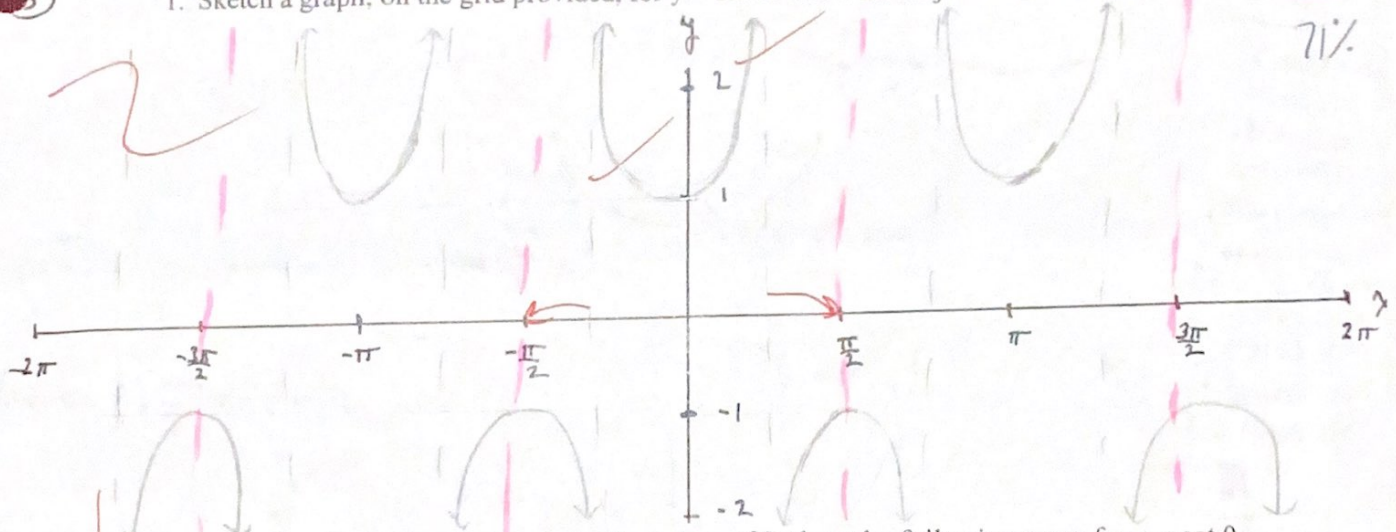
71%

1. Sketch a graph, on the grid provided, for y = sec x. Show all major characteristics.



2. For the interval $-2\pi \le \theta \le 2\pi$, give the values of θ where the following occur for y = cot θ.

a) asymptotes $-2\pi, -\pi, \pi, 2\pi, 0$ b) zeros $-\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$

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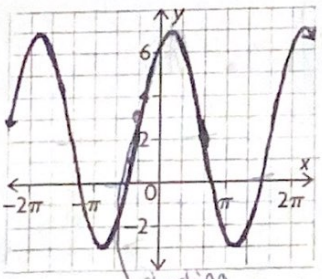
3. The following graph is a sine curve. Determine the equation of the graph.



max = 7
min = -3
amp. $= \frac{7-(-3)}{2} = 5$
e.o.a. $= \frac{7+(-3)}{2} = 2$

starting point, $x = \frac{\pi}{3}$ left

or $y = 5\cos\left(x - \frac{\pi}{6}\right) + 2$ if it said use cos
→ moved left $\frac{\pi}{2}$
period is 2π
So no k-value because period stays the same

$y = 5\sin\left(x + \frac{\pi}{2}\right) + 2$

$+\frac{\pi}{3} = c$

$\frac{2\pi}{k} = p$

$p = 2\pi$

$\frac{2\pi}{2\pi} = 1$

$k = 1$

3

4

4. The population of a ski-resort town, as a function of the number of months into the year, can be described by a ~~trig~~ function. The maximum population of the town is about 15 000 people, and the minimum population is about 500 people. At the beginning of the year, the population is at its greatest. After six months, the population reaches its lowest number of people. What is the equation of the ~~trig~~ function that describes the population of this town?

max = 15000
min = 500
$a = \frac{15000-500}{2} = 7250$
$e.o.a = \frac{15000+500}{2} = 7750$

use cos because it starts at a max.
From the max to min it took 6 months,
∴ the period is 2x6, or 12 months

$y = 7250\cos\left(\frac{\pi}{6}x\right) + 7750$ ←

$K = \frac{2\pi}{p}$ (p = period) $k = \frac{2\pi}{12} = \frac{\pi}{6}$

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*calc. should be ... for whole test

(4)

5. A weight is bobbing up and down on a spring attached to a ceiling. The data in the following table give the height of the weight above the floor as it bobs. Determine the sine function that models this situation.

t(s)	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4
h(t) cm	180	204	249	270	249	201	180	204	246	270	249	201

one period 0-2.4

max and min mean y-value

max height → 180
min height → 270

$\frac{180+270}{2}$ = equation of axis → = 225

amplitude = $\frac{270-180}{2}$ = 45

One period: 2 seconds → $K = \frac{2\pi}{P} = \frac{2\pi}{2} = \pi$

Period = 2.4 → $\frac{2\pi}{2.4} = K$ → $\frac{20\pi}{24}$ → $K = \frac{5\pi}{6}$

for period look at x's

a = 45
d = 225
K = π
c = /

using sin graph because the weight starts at a minimum

$y = 45\sin(\pi x) + 225$

$y = 45\sin\left(\frac{5\pi}{4}(t-0.6)\right)+2$

C value
Sin starts in the middle. If you start at the min (180) and the max is 270, the x-values are at 0 and 1.2. The middle is at 0.6. It's been moved to the right 0.6

(8)

6. A person's blood pressure, $P(t)$, in millimetres of mercury (mm Hg), is modelled by the function $P(t) = 80 - 14\cos\left(\frac{8\pi}{5}t\right)$, where t is the time in seconds.

a) What is the period of the function?

b) What does the value of the period mean in this situation?

c) Calculate the average rate of change in a person's blood pressure on the interval $t \in [0.2, 0.3]$. (2 decimals)

d) Estimate the instantaneous rate of change in a person's blood pressure at $t = 0.5$. (2 decimals)

c) $P(0.2) = 80 - 14\cos\left(\frac{8\pi}{5}(0.2)\right) = 72.49$

$P(0.3) = 80 - 14\cos\left(\frac{8\pi}{5}(0.3)\right) = 79.12$

(0.2, 72.49) (0.3, 79.12)
x_2 y_2

AROC = $\frac{y_2-y_1}{x_2-x_1} = \frac{79.12-72.49}{0.3-0.2} = \frac{6.63}{0.1}$

AROC = 66.3 / 66.23 ml/sec

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NO ROUNDING

a) $P = \frac{2\pi}{K} = \frac{2\pi}{8/5\pi} = \frac{5\pi}{4}$

b) How long one heartbeat takes

d) $\frac{f(a+h)-f(a)}{h}$ $a = 0.5$ $h = 0.001$

$P(0.501) = 80 - 14\cos\left(\frac{8\pi}{5}(0.501)\right) = 91.36$

$P(0.5) = 80 - 14\cos\left(\frac{8\pi}{5}(0.5)\right) = 91.32$

$\frac{91.36-91.32}{0.001}$

AROC = 40

41.22 ml/sec

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(6)

7. For $\underline{y = \sin x}$, describe where the following would occur and give a specific value or interval for x where this situation occurs.

a) IROC = 0

$x = \frac{\pi}{2}, \frac{3\pi}{2}$ at any maximum or minimum value

ex. When $x = 1$ or $x = -1$

b) AROC ≤ 0

The AROC would be equal to zero at any horizontal line between 2 points when $y = 0$. ex. $0 \le x \le \pi$

The AROC would be negative for any time the graph has a decreasing (negative) slope. ex. $\frac{\pi}{2} \le x \le \frac{3\pi}{2}$

c) IROC is a maximum (positive)

neg. not pos.!

The IROC would be maximum at the equation of the axis, when $y = 0$.

ex. $x = 0, 2\pi$ the rate of change is highest because the slope is the steepest

$x = 0$ or 2π

C2

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