Applications of Sinusoidal Functions III (5.4) pg 276 day 9

why is c called phase shift?

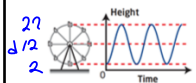
music and videos - what happens when you are out of phase?

Listen to the Music @ 2:00

Applications of Sinusoidal Functions III (5.4) pg 276 day 9

#12, 13, 19

19. A Ferris wheel with a radius of 10 m rotates once every 60 s. Passengers get on board at a point 2 m above the ground at the bottom of the Ferris wheel. A sketch for the first 150 s is shown.



a) Write an equation to model the path of a passenger on the Ferris wheel, where the height is a function of time.

b) If Emily is at the bottom of the Ferris wheel when it begins to move, determine her height above the ground, to the nearest tenth of a metre, when the wheel has been in motion for 2.3 min.

12. The University of Calgary's Institu for Space Research is leading a pr to launch Cassiope, a hybrid spac satellite. Cassiope will follow a pa that may be modelled by the func $h(t) = 350 \sin 28\pi(t - 25) + 400$, is the height, in kilometres, of the above Earth and t is the time, in d

a) Determine the period of the sa

b) How many minutes will it take satellite to orbit Earth?

c) How many orbits per day will satellite make?

3. The Arctic fox is common throughout the Arctic tundra. Suppose the population, F, of foxes in a region of northern Manitoba is modelled by the function $F(t) = 500 \sin \frac{\pi}{12}t + 1000$, where t is the time, in months.

a) How many months would it take for the fox population to drop to 650? Round your answer to the nearest month.

b) One of the main food sources for the Arctic fox is the lemming. Suppose the population, L, of lemmings in the region is modelled by the function $L(t) = 5000 \sin \frac{\pi}{12}(t - 12) + 10\,000$. Graph the function $L(t)$ using the same set of axes as for $F(t)$.

c) From the graph, determine the maximum and minimum numbers of foxes and lemmings and the months in which those occur.

d) Describe the relationships between the maximum, minimum, and mean points of the two curves in terms of the lifestyles of the foxes and lemmings. List possible causes for the fluctuation in populations.

per = 24

$650 = 500 \sin\left(\frac{\pi}{12}t\right) + 1000$

$-350 = 500 \sin\left(\frac{\pi}{12}t\right)$

$-0.7 = \sin\left(\frac{\pi}{12}t\right)$ sin⁻¹

$-0.775 \text{ rad} = \frac{\pi}{12}t$

$-3 = t$

3 months ago

$\pi - (-0.775) = 3.917$ rad

$\therefore 3.917 = \frac{\pi}{12}t$

$15 = t$

Applications of Sinusoidal Functions III (5.4) pg 276 day 9

ex1: The tide level at Canoe Cove today is approximated by

$h(t) = 2.8\cos 0.515(t - 1.5) + 4.8$

t is the time in hours
h is the height in ft
midnight is 0

a) How high is the high tide?

http://www.tide-forecast.com/locations/Canoe-Cove-Prince-Edward-Island/tides/latest

max = 4.8 + 2.8 = 7.6 ft

b) How low is low tide?

min = 4.8 − 2.8 = 2 ft

c) When is high tide?

c = 1.5 so 1:30 am

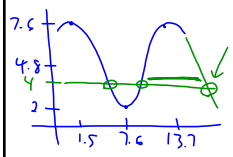
d) What is the time from one high tide to the next?

$\text{per} = \frac{2\pi}{0.515} = 12.2$ or 12h12min

e) When is low tide?

$\frac{12.2}{2} = 6.1$ so 1.5 + 6.1 = 7.6 7:36am

f) Sketch the function.



next high
1.5 + 12.2
= 13.7

Applications of Sinusoidal Functions III (5.4) pg 276 day 9

ex1: The tide level at Canoe Cove today is approximated by

$h(t) = 2.8\cos 0.515(t - 1.5) + 4.8$

t is the time in hours
h is the height in ft
midnight is 0

g) You can only jump off the bridge if the water is more than 4 feet deep. Between what times can you jump this afternoon?

$4 = 2.8 \cos 0.515(t - 1.5) + 4.8$ 17

$-0.286 = \cos 0.515(t - 1.5)$

$1.86 \text{ rad} = 0.515(t - 1.5)$

$5.1 = t$

5:06 am

$2\pi - \theta$

$2\pi - 1.86 = 4.42$

$\therefore 4.42 = 0.515(t - 1.5)$

$10.1 = t$

10:06 am

$5.1 + 12.2 = 17.3$

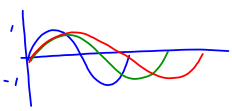
5:18 pm

∴ any time before 5:18 pm

Applications of Sinusoidal Functions III (5.4) pg 276 day 9

Biorhythms

The theory says we all have 3 cycles:



	period	b	
physical	23 days	$\frac{2\pi}{23} = 0.2732$	$y = \sin(0.2732x)$
emotional	28 days	$\frac{2\pi}{28} = 0.2244$	$y = \sin(0.2244x)$
intellectual	33 days	$\frac{2\pi}{33} = 0.1904$	$y = \sin(0.1904x)$

use sin

All cycles start at 0 when you are born.
Each one moves between -1 and 1.

x is your age in days

Applications of Sinusoidal Functions III (5.4) p276 day 9

Biorhythms

But you need to know how old you are in days.

How do you figure out your age in days? ex: Jan 21, 2004

#days= age x 365 + #leap years + (today - birthday)

$$= 17 \times 365 + \underset{\text{or } 4}{5} + (314 - 21)$$

all

$$= 6503$$

49*365+13+(296-21)=18,173

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	1
2	2	33	61	92	122	153	183	214	245	275	306	336	2
3	3	34	62	93	123	154	184	215	246	276	307	337	3
4	4	35	63	94	124	155	185	216	247	277	308	338	4
5	5	36	64	95	125	156	186	217	248	278	309	339	5
6	6	37	65	96	126	157	187	218	249	279	310	340	6
7	7	38	66	97	127	158	188	219	250	280	311	341	7
8	8	39	67	98	128	159	189	220	251	281	312	342	8
9	9	40	68	99	129	160	190	221	252	282	313	343	9
10	10	41	69	100	130	161	191	222	253	283	314	344	10
11	11	42	70	101	131	162	192	223	254	284	315	345	11
12	12	43	71	102	132	163	193	224	255	285	316	346	12
13	13	44	72	103	133	164	194	225	256	286	317	347	13
14	14	45	73	104	134	165	195	226	257	287	318	348	14
15	15	46	74	105	135	166	196	227	258	288	319	349	15
16	16	47	75	106	136	167	197	228	259	289	320	350	16
17	17	48	76	107	137	168	198	229	260	290	321	351	17
18	18	49	77	108	138	169	199	230	261	291	322	352	18
19	19	50	78	109	139	170	200	231	262	292	323	353	19
20	20	51	79	110	140	171	201	232	263	293	324	354	20
21	21	52	80	111	141	172	202	233	264	294	325	355	21
22	22	53	81	112	142	173	203	234	265	295	326	356	22
23	23	54	82	113	143	174	204	235	266	296	327	357	23
24	24	55	83	114	144	175	205	236	267	297	328	358	24
25	25	56	84	115	145	176	206	237	268	298	329	359	25
26	26	57	85	116	146	177	207	238	269	299	330	360	26
27	27	58	86	117	147	178	208	239	270	300	331	361	27
28	28	59	87	118	148	179	209	240	271	301	332	362	28
29	29		88	119	149	180	210	241	272	302	333	363	29
30	30		89	120	150	181	211	242	273	303	334	364	30
31	31		90		151		212	243		304		365	31

Applications of Sinusoidal Functions III (5.4) p276 day 9

Biorhythms

The theory says we all have 3 cycles:

18,556

physical $y = \sin(0.2732x)$ -0.86

emotional $y = \sin(0.2244x)$ -0.98

intellectual $y = \sin(0.1904x)$ 0.94

use rad!

Applications of Sinusoidal Functions III (5.4) p276 day 9

HW: 17, 20, 21