Misconnected with my grader since Thursday. We will have all work turned in by today back to you on Thursday. Since Conversation Day is next Tuesday, don't hand anything in on Thursday. Wait until the day of or the day after the test to turn in any further Chapter 1 homework.

7. (10 pts) Write the cosine function that achieves its maximum height of $y = 7$ centimeters at time $t = 2$ seconds and its minimum height of $y = -4$ centimeters at $t = 30$ seconds.

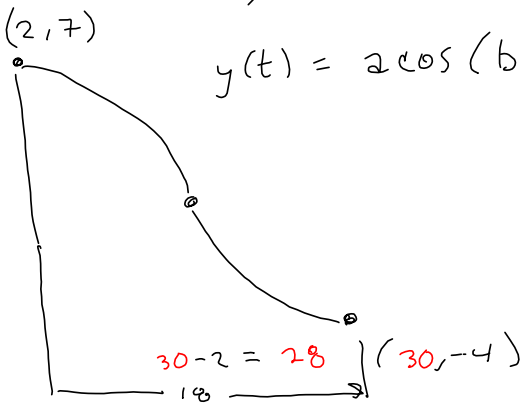
A

For 3 points w/o knowing anything:

Let y = height, in cm, as a function of t = time, in seconds.

$y(2) = 7 \rightsquigarrow (2, 7)$

$y(30) = -4 \rightsquigarrow (30, -4)$



$y(t) = a\cos(b(t-c)) + d$

$\frac{1}{2}$ period $= 28 \rightsquigarrow \frac{\pi}{28} = c$

OR: $\frac{1}{2}T = 28 \Rightarrow$

$T = 56 \Rightarrow$

$bt = 2\pi$ when $t = 56$, so

$b \cdot 56 = 56b = 2\pi \Rightarrow$

$b = \frac{2\pi}{56} = \frac{\pi}{28}$

$y(t) = a\cos\left(\frac{\pi}{28}(t-c)\right) + d$

High Point (a) $t = 2 \Rightarrow c = 2$, so

$a\cos\left(\frac{\pi}{28}(t-2)\right) + d$

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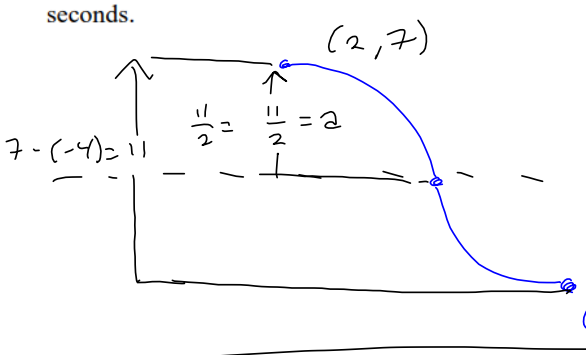
7. (10 pts) Write the cosine function that achieves its maximum height of $y = 7$ centimeters at time $t = 2$ seconds and its minimum height of $y = -4$ centimeters at $t = 30$ seconds.

A



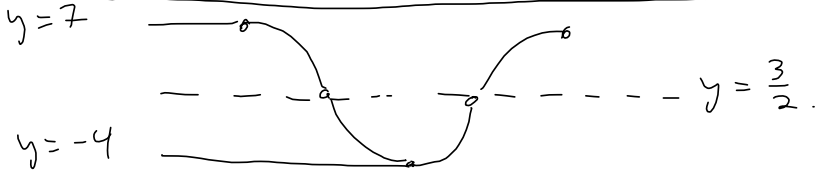
$\frac{11}{2}\cos\left(\frac{\pi}{28}(t-2)\right) + d$

And finally, the midline is halfway between the high & the low, i.e., their average:

$\frac{7+(-4)}{2} = \frac{3}{2} = d$. This gives

$$y(t) = \frac{11}{2}\cos\left(\frac{\pi}{28}(t-2)\right) + \frac{3}{2}$$

FINAL ANSWER.



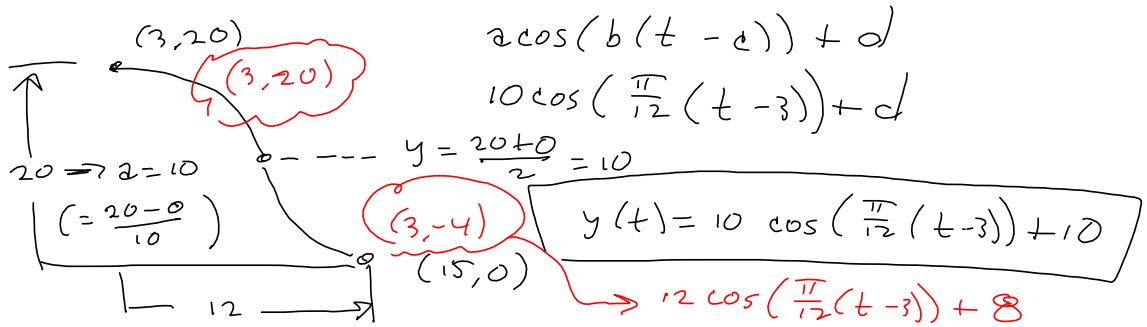
High tide is 20 feet at 3 a.m. Low tide is 0 feet at 3 p.m.
Build a cosine function that describes the tide.

By inspection, period $T = 24$ hrs!

(3, ugh.

Let y = height of tide, in feet, as a function of t = time, in hours, after midnight.

Then 3 p.m. $\Rightarrow t = 3 + 12 = 15$ hrs.



seconds.

8. (5 pts) Solve the triangle. That means, find all lengths and angles. Exact answers required.

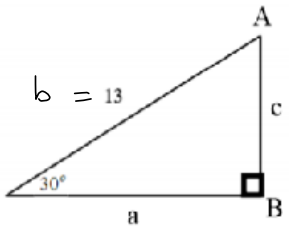


Figure for #8

9. Find the exact value of...

$\Theta = 30^\circ$

$b = 13$ messes up the $a^2+b^2=c^2$ thing, if you're careless!

$\sin\Theta = \frac{b}{13}$

ONE Fix: Re-label

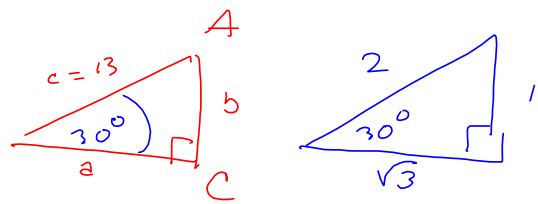
Say you're re-labeling!

$\sin\Theta = \frac{b}{13}$ so

$13\sin 30^\circ = b$

$= 13\left(\frac{1}{2}\right) = \boxed{\frac{13}{2} = b}$

Then this is OK.



MAKE C the right angle, i.e., the BIG angle, so the BIG side is c.

$\cos 30^\circ = \frac{a}{13}$ so

$a = 13\cos 30^\circ = 13\left(\frac{\sqrt{3}}{2}\right) = \boxed{\frac{13\sqrt{3}}{2} = a}$

And, since $\Theta = B = 30^\circ$ & $C = 90^\circ$, A must be $\boxed{A = 60^\circ}$

9. Find the exact value of…

a. … (5 pts) $\tan\left(\arccos\left(\frac{2}{11}\right)\right)$.

b. … (5 pts) $\arccos\left(\sin\left(\frac{7\pi}{4}\right)\right)$

Can cheat these w/ proper use of calculator!

(2) My way! $\tan(\arccos(\frac{2}{11})) = \tan\theta$

$11^2 - 2^2 = 121 - 4 = 117$

$\tan\theta = \frac{\sqrt{117}}{2}$ FULL CREDIT

CALCULATOR: $\arccos(\frac{2}{11}) \approx 79.52431831^\circ$

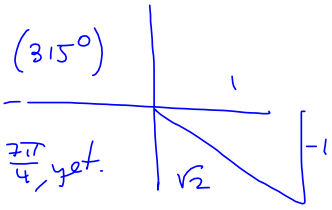
$\tan(79...^\circ) \approx 5.408326919$ $\left(\approx \frac{\sqrt{117}}{2}!\right)$

↳ 20% off, i.e., lose a point on this 5-pointer for being digital & non-intuitive. But you get most of the points, with a digital method for checking your work, when you did it with pictures & ideas instead of pushing buttons w/o understanding.

(b) $\arccos\left(\sin\left(\frac{7\pi}{4}\right)\right)$

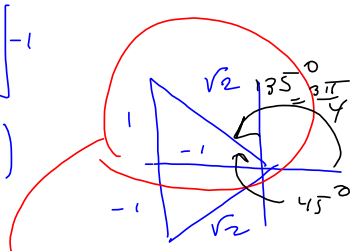
$\sin\frac{7\pi}{4} = \sin(315^\circ)$

$\left(\frac{7\pi}{4}\right)\left(\frac{180}{\pi}\right) = 315^\circ$ if you can't see the $\frac{7\pi}{4}$ yet.



$\arccos\left(\sin\left(\frac{7\pi}{4}\right)\right) = \arccos\left(\frac{-1}{\sqrt{2}}\right)$

$= \frac{3\pi}{4} = 135^\circ$



arccosine sees this one, only

CALCULATOR CHEAT: MAKE SURE YOU'RE IN THE RIGHT MODE OR convert from degrees to radians (or vice-versa.)

$\sin\left(\frac{7\pi}{4}\right) = \frac{-1}{\sqrt{2}}$ by knowledge or just

$\sin\left(\frac{7\pi}{4}\right) \approx -0.7071067810$

$\arccos(-0.7071067810) = \cos^{-1}(-0.7071067810) \approx$ 2.356194490 radians, 135.0000000 degrees.

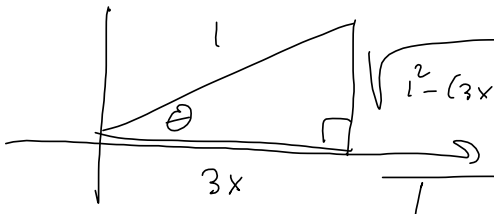
Your calculator won't give a nice, exact π-radians answer. Again, lose 1 point for ignoring me. :-

10. (5 pts) Draw the sketch and use it to find an algebraic expression that is equivalent to $\sin(\arccos(3x))$

$= \sin\theta$

$\arccos(3x)$

θ = angle whose cosine is $3x$, we always put these types in Q1.



or $\sqrt{1-9x^2}$

So, $\sin\theta = \dfrac{\sqrt{1-9x^2}}{3x}$!

Scott gets 5 points!