Sets & Steps
Math Practice & Worked Solutions

Precalculus

Sinusoidal Amplitude, Period & Phase | 3-Topic Precalculus Bundle

3-topic bundle | 288 problems | Four activity formats

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01 Sinusoidal Amplitude and Midline

View individual product and its full preview

02 Period and Frequency of Sinusoids

View individual product and its full preview

03 Phase Shifts of Sine and Cosine

View individual product and its full preview

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

24 PDFs and 3 READMEs; 212 buyer PDF pages across the 3 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

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Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Sinusoidal Amplitude and Midline

Sinusoidal Amplitude and Midline | APPC-U03-P08

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for exact transformed local range, feature comparison and invariant, global pointwise relation and proof, vertical transformation equation, first error and minimal repair and invalid claim or first invalid step, corrected conclusion, brief mathematical reason, and the requested underlying result.

8 PDFs and a README; 70 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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AP Precalculus

Sinusoidal Amplitude and Midline

Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

For $y = -4\cos x + 1$, complete the table by applying the vertical output map to each listed parent output. Use the sign of the scale rather than reading a decorative graph height.

Required response

parent output	transformed output
0	_____
1	_____

Bank label: _____

Under $y = 3\sin x + 2$, a transformed output $Y = \frac{23}{4}$ is requested. Reverse the output map to find the required parent output, then decide whether that output is available from the sin parent.

Required response

required parent output	transformed output
_____	$\frac{23}{4}$

Bank label: _____

For $y = 2\cos x + 5$, complete the table by applying the vertical output map to each listed parent output. Use the sign of the scale rather than reading a decorative graph height.

Required response

parent output	transformed output
-1	_____
0	_____
1	_____

Bank label: _____

A complete cycle has minimum 2 and maximum 6. For the supplied parent $p(x) = \sin x$, the labeled anchor has parent output -1 and transformed output 6. Recover amplitude, midline, and every coefficient sign supported by this evidence.

Required response

feature	output	model output	parent output
global minimum	2	_____	_____
global maximum	6	_____	_____
anchor $x = 3\frac{\pi}{2}$	_____	6	-1

Bank label: _____

AP Precalculus

Sinusoidal Amplitude and Midline

Name: _____ **Date:** _____ **Class:** _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

For $y = (-\frac{1}{2})\cos x + 2$, the horizontal rule is fixed as the cos parent. State the amplitude, midline, full-cycle range, and whether the parent output is vertically reflected.	On the stated x-window $[0, \frac{\pi}{2}]$, the sin parent has certified local output range $[0, 1]$. Under $y = 2\sin x + 1$, determine the transformed range on this same window, preserving open or closed endpoints. Do not substitute the full-cycle range.
For $y = -3\sin x - 2$, the horizontal rule is fixed as the sin parent. State the amplitude, midline, full-cycle range, and whether the parent output is vertically reflected.	On the stated x-window $[-\frac{\pi}{2}, 0]$, the sin parent has certified local output range $[-1, 0]$. Under $y = 4\sin x + 1$, determine the transformed range on this same window, preserving open or closed endpoints. Do not substitute the full-cycle range.
For $y = 4\sin x - 3$, the horizontal rule is fixed as the sin parent. State the amplitude, midline, full-cycle range, and whether the parent output is vertically reflected.	Compare $y = 3\cos x - 1$ and $y = -3\cos x - 1$. State amplitudes, midlines, full-cycle ranges, whether the ranges overlap, relative vertical orientation, and the horizontal invariant.

AP Precalculus

Sinusoidal Amplitude and Midline

Name: _____ **Date:** _____ **Class:** _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START

On the stated x-window $[\frac{\pi}{3}, \pi]$, the cos parent has certified local output range $[-1, \frac{1}{2}]$. Under $y = -2\cos x + 2$, determine the transformed range on this same window, preserving open or closed endpoints. Do not substitute the full-cycle range.

Your response: _____

Incoming: $[1, 4]$; order reversed under the negative scale

Starting from $p(x) = \cos x$, perform this vertical-only task: Translate parent outputs by $\frac{3}{2}$, scale the result by 2, and finally translate by -5. Write an equation with the same horizontal rule and show how the operation order controls the midline.

Your response: _____

Incoming: $y = 2(\cos x + \frac{3}{2}) - 5$

On the stated x-window $[0, \frac{\pi}{2})$, the cos parent has certified local output range $(0, 1]$. Under $y = 3\cos x - 1$, determine the transformed range on this same window, preserving open or closed endpoints. Do not substitute the full-cycle range.

Your response: _____

Incoming: $(-1, 2]$; order preserved under the positive scale

A complete cycle has minimum -9 and maximum -1. For the supplied parent $p(x) = \cos x$, the labeled anchor has parent output 1 and transformed output -1. Recover amplitude, midline, and every coefficient sign supported by this evidence.

Required response

feature	output	model output	parent output
global minimum	-9	_____	_____
global maximum	-1	_____	_____
anchor $x = 0$	_____	-1	1

Your response: _____

AP Precalculus

Sinusoidal Amplitude and Midline

Name: _____ **Date:** _____ **Class:** _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Audit the student's vertical-feature inference using full-cycle extrema, the affine output map, operation order, and visible-window limits as relevant. Identify the first mathematical error and give the smallest sufficient repair. output map: $Y = -2p + 3$; restricted parent range: $[0, 1]$; student range: $[1, 5]$. Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

A student claims: "Using the first two rows gives $a = 1$ and $d = 3$, so $Y = \cos x + 3$ fits all three rows." Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete or verify the underlying task: Fit $Y = ap + d$ to the first two distinct parent-output rows in the supplied cos table, then audit the third row. State whether one vertical-only sinusoid fits all observations.

Identify the stated incorrect claim or first invalid step, give the corrected result, and state a brief mathematical reason.

parent output	target output
-1	-2
0	1
1	4

Sinusoidal Amplitude and Midline

Full Worked Solutions - excerpt

Worked example

Problem. Starting from $p(x) = \cos x$, perform this vertical-only task: First multiply every cos output by -3, then translate outputs by -1. Write an equation with the same horizontal rule and show how the operation order controls the midline.

Answer. y = $-3\cos x - 1$

Explanation and check.

Apply the actions to the output p in order. $Y = -3p - 1$; hence $y = -3\cos x - 1$.

Worked example

Problem. Starting from $p(x) = \cos x$, perform this vertical-only task: Reflect the graph $y = \cos x$ across the horizontal line $y = 4$. Write an equation with the same horizontal rule and show how the operation order controls the midline.

Answer. y = - $\cos x + 8$

Explanation and check.

Apply the actions to the output p in order. $Y = 2(4) - p = -p + 8$; hence $y = -\cos x + 8$.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Period and Frequency of Sinusoids

Period and Frequency of Sinusoids | APPC-U03-P09

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for period and ordinary frequency, normalized frequencies and comparison, possible b values and verification, complete traversals, residual cycle, ending phase, first error and repair and supported candidates and needed evidence.

8 PDFs and a README; 75 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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AP Precalculus

Period and Frequency of Sinusoids

Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

For $y = \cos((-\frac{\pi}{4})x)$, the argument is in radians and x is measured in seconds. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency. Bank label: _____	Construct $y = \sin(bx)$ or $y = \cos(bx)$ with period 4π; input is measured in radian units. The parent phase at the origin is fixed. Respect the stated sign information (either) and list every supported b, converting units before using $\lvert b\rvert = \frac{2\pi}{T}$. Bank label: _____
A sinusoid has period $\frac{4}{3}$ seconds. An inclusive observation window lasts 5 seconds and begins $\frac{1}{2}$ of a cycle after the fixed cycle origin. Count complete cycle traversals within the elapsed window, the residual fraction of a traversal, and the ending phase modulo one cycle. Do not count an endpoint event as an extra traversal. Bank label: _____	For $y = \cos((4)x)$, the argument is in radians and x is measured in seconds. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency. Bank label: _____
Construct $y = \sin(bx)$ or $y = \cos(bx)$ with frequency $\frac{1}{8}$ cycles per hour; input is measured in hours. The parent phase at the origin is fixed. Respect the stated sign information (either) and list every supported b, converting units if needed before using $\lvert b\rvert = \frac{2\pi}{T}$. Bank label: _____	A sinusoid has period 8 seconds. An inclusive observation window lasts 17 seconds and begins $\frac{7}{8}$ of a cycle after the fixed cycle origin. Count complete cycle traversals within the elapsed window, the residual fraction of a traversal, and the ending phase modulo one cycle. Do not count an endpoint event as an extra traversal. Bank label: _____
For $y = \cos((3\frac{\pi}{2})x)$, the argument is in radians and x is measured in hours. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency. Bank label: _____	Construct $y = \sin(bx)$ or $y = \cos(bx)$ with frequency 2 cycles per second; input is measured in seconds. The parent phase at the origin is fixed. Respect the stated sign information (either) and list every supported b, converting units if needed before using $\lvert b\rvert = \frac{2\pi}{T}$. Bank label: _____

AP Precalculus

Period and Frequency of Sinusoids

Name: _____ **Date:** _____ **Class:** _____

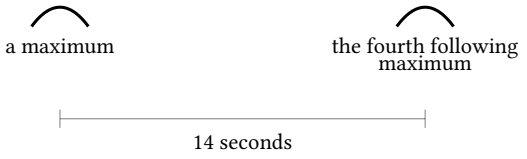
Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Map the listed parent-angle anchors u to the graph of $y = \cos(-3x)$. Complete the transformed x-inputs using $u = bx$, retain each parent output, and state whether left-to-right anchor order is preserved or reversed.

Required response

parent angle	parent output	transformed input
0	1	_____
$\frac{\pi}{2}$	0	_____
π	-1	_____
$3\frac{\pi}{2}$	0	_____
2π	1	_____

A sinusoidal graph labels a maximum and the fourth following maximum 14 seconds apart. The graph explicitly certifies the stated events as consecutive or gives the exact number skipped, and crossing directions are shown. Determine the smallest period and justify the cycle fraction used.



Map the listed parent-angle anchors u to the graph of $y = \cos(\frac{1}{3}x)$. Complete the transformed x-inputs using $u = bx$, retain each parent output, and state whether left-to-right anchor order is preserved or reversed.

Required response

parent angle	parent output	transformed input
0	1	_____
$\frac{\pi}{2}$	0	_____
π	-1	_____
$3\frac{\pi}{2}$	0	_____

Construct $y = \sin(bx)$ or $y = \cos(bx)$ with period 360; input is measured in degrees of physical input. The parent phase at the origin is fixed. Respect the stated sign information (either) and list every supported b, converting units before using $|b| = \frac{2\pi}{T}$.

AP Precalculus

Period and Frequency of Sinusoids

Name: _____ **Date:** _____ **Class:** _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START

A sinusoid has period 3 seconds. An inclusive observation window lasts 8 seconds and begins 0 of a cycle after the fixed cycle origin. Count complete cycle traversals within the elapsed window, the residual fraction of a traversal, and the ending phase modulo one cycle. Do not count an endpoint event as an extra traversal.

Your response: _____

Incoming: 2 complete cycles; residual $\frac{2}{3}$ cycle; ending phase $\frac{2}{3}$ cycle

Construct $y = \sin(bx)$ or $y = \cos(bx)$ with period 5; input is measured in minutes. The parent phase at the origin is fixed. Respect the stated sign information (positive) and list every supported b, converting units before using $|b| = \frac{2\pi}{T}$.

Your response: _____

Incoming: b = $2\frac{\pi}{5}$

For $y = \cos((\frac{1}{2})x)$, the argument is in radians and x is measured in radian input. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency.

Your response: _____

Incoming: period 4π; frequency $\frac{1}{4\pi}$ cycles per input unit

A sinusoid has period 2 seconds. An inclusive observation window lasts 6 seconds and begins $\frac{1}{4}$ of a cycle after the fixed cycle origin. Count complete cycle traversals within the elapsed window, the residual fraction of a traversal, and the ending phase modulo one cycle. Do not count an endpoint event as an extra traversal.

Your response: _____

AP Precalculus

Period and Frequency of Sinusoids

Name: _____ **Date:** _____ **Class:** _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

The supplied cos sample table is finite. Audit the listed candidate rules against every row and decide whether the period is identified. Explain any aliasing and name one minimal additional sample or bound that would resolve or narrow it. Measure the trigonometric arguments in radians. Compare the candidate rules $\cos(2\pi t), \cos(4\pi t)$. Work with sinusoidal recurrence with fixed origin and phase. No additional constraint is supplied. Only the displayed finite samples are given. The supplied samples are $(\text{output } 1;\ t0), (\text{output } -\frac{1}{2};\ t\frac{1}{3}), (\text{output } -\frac{1}{2};\ t\frac{2}{3}), (\text{output } 1;\ t1)$.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

output	t
1	0
$-\frac{1}{2}$	$\frac{1}{3}$
$-\frac{1}{2}$	$\frac{2}{3}$
1	1

Audit the proposed horizontal-scaling explanation. Check nonconstancy, full-cycle phase change, landmark direction, sampling limits, and input units as relevant. Identify the first error and give the smallest sufficient repair. Work with sinusoidal recurrence with fixed origin and phase. Use $y = \sin(\pi\frac{t}{30})$. A student claims: frequency is $\frac{\pi}{30}$ cycles/s Measure t in seconds.

Period and Frequency of Sinusoids

Full Worked Solutions - excerpt

Worked example

Problem. For $y = \sin((\pi)x)$, the argument is in radians and x is measured in seconds. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency.

Answer. period 2; frequency $\frac{1}{2}$ cycles per input unit

Explanation and check.

For a nonconstant parent, $T = \frac{2\pi}{|b|} = 2$. Then ordinary frequency is $\frac{1}{T} = \frac{1}{2}$; b instead measures radians of phase per input unit.

Worked example

Problem. For $y = \sin((6)x)$, the argument is in radians and x is measured in days. Find the smallest positive period and the ordinary frequency in cycles per input unit. Explain why the inside multiplier itself is not generally the ordinary frequency.

Answer. period $\frac{\pi}{3}$; frequency $\frac{3}{\pi}$ cycles per input unit

Explanation and check.

For a nonconstant parent, $T = \frac{2\pi}{|b|} = \frac{\pi}{3}$. Then ordinary frequency is $\frac{1}{T} = \frac{3}{\pi}$; b instead measures radians of phase per input unit.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Phase Shifts of Sine and Cosine

Phase Shifts of Sine and Cosine | APPC-U03-P10

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for equivalence and canonical representatives, first error and minimal repair, new phase shift and event verification, shifted anchors and window qualification, phase classes or consistency conclusion and phase class and canonical representative.

8 PDFs and a README; 67 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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AP Precalculus

Phase Shifts of Sine and Cosine

Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Translate every listed landmark of $y = \cos x$ horizontally by $h = 3\frac{\pi}{2}$. Complete the shifted coordinates, retain all y-values, and note that a plotting window may clip a landmark without changing the phase rule.

Required response

parent anchor	shifted x
x $-\pi$ **y** -1	_____
x $-\frac{\pi}{2}$ **y** 0	_____
x 0 **y** 1	_____
x $\frac{\pi}{2}$ **y** 0	_____

Bank label: _____

Amplitude, midline, family, and period are fixed as shown. Determine whether the observations identify one phase class, leave several, or are inconsistent. Treat a midline or nonextreme level without direction as ambiguous.

Given: domain: phase analysis with amplitude and period fixed; family: sin; midline: 0; observation table: (event: upward midline; x: 1); period: 4; signed amplitude: 1

Required response

event	x
upward midline	1

Bank label: _____

Amplitude, midline, family, and period are fixed as shown. Determine whether the observations identify one phase class, leave several, or are inconsistent. Treat a midline or nonextreme level without direction as ambiguous.

Given: domain: phase analysis with amplitude and period fixed; family: cos; midline: 0; observation table: (event: minimum; x: 7); period: 10; signed amplitude: 1

Required response

event	x
minimum	7

Bank label: _____

Amplitude, midline, family, and period are fixed as shown. Determine whether the observations identify one phase class, leave several, or are inconsistent. Treat a midline or nonextreme level without direction as ambiguous.

Given: domain: phase analysis with amplitude and period fixed; family: sin; midline: 0; observation table: (event: downward midline; x: 5); period: 8; signed amplitude: 1

Required response

event	x
downward midline	5

Bank label: _____

AP Precalculus

Phase Shifts of Sine and Cosine

Name: _____ **Date:** _____ **Class:** _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Translate every listed landmark of $y = \sin x$ horizontally by $h = 13\frac{\pi}{4}$. Complete the shifted coordinates, retain all y-values, and note that a plotting window may clip a landmark without changing the phase rule.

Required response

parent anchor	shifted x
x $-\pi$ **y** 0	_____
x 0 **y** 0	_____
x π **y** 0	_____
x 2π **y** 0	_____

Amplitude, midline, family, and period are fixed as shown. Determine whether the observations identify one phase class, leave several, or are inconsistent. Treat a midline or nonextreme level without direction as ambiguous.

Given: domain: phase analysis with amplitude and period fixed; family: cos; midline: 0; observation table: (direction: not specified; level: midline; x: 3); period: 8; signed amplitude: 1

Required response

direction	level	x
not specified	midline	3

Translate every listed landmark of $y = \cos x$ horizontally by $h = -4\frac{\pi}{3}$. Complete the shifted coordinates, retain all y-values, and note that a plotting window may clip a landmark without changing the phase rule.

Required response

parent anchor	shifted x
x $-\pi$ **y** -1	_____
x $-\frac{\pi}{2}$ **y** 0	_____
x 0 **y** 1	_____
x $\frac{\pi}{2}$ **y** 0	_____

For y=-cos(2π(x-h)/10), amplitude sign and period are fixed. A labeled maximum occurs at x=7. Find h modulo the period and give the representative in [0,10).

AP Precalculus

Phase Shifts of Sine and Cosine

Name: _____ **Date:** _____ **Class:** _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: First issue: a positive-sine peak occurs a quarter period after h, so $h = 0$; repair/defense: subtract $\frac{T}{4}$ from the peak location.

Rewrite the radian argument of y=cos((7/3)x-14π/9) in the form b(x-h). State h in x-units and distinguish it from the angular constant -14π/9.

Your response: _____

Incoming: not equivalent; representatives $\frac{9}{2}$ and 2 differ modulo 5

Two sine rules have the same signed amplitude and period 7, with shifts h_1=−2 and h_2=12. Decide whether they define the same graph. Reduce each shift modulo the period; a half-period difference does not count as equivalent when the amplitude sign is fixed.

Your response: _____

Incoming: $h \equiv \frac{3}{2} \pmod 5$; canonical $h = \frac{3}{2}$

Rewrite the radian argument of y=sin((-4/3)x+10π/9) in the form b(x-h). State h in x-units and distinguish it from the angular constant 10π/9.

Your response: _____

Incoming: equivalent; difference 12 = 1 period(s); common representative 7

For y=sin(2π(x-h)/(5/2)), amplitude sign and period are fixed. A labeled minimum occurs at x=19/8. Find h modulo the period and give the representative in [0,5/2).

Your response: _____

Incoming: argument $\frac{7}{3}(x - 2\frac{\pi}{3})$; $h = 2\frac{\pi}{3}$

Rewrite the radian argument of y=sin((-9/4)x-27π/8) in the form b(x-h). State h in x-units and distinguish it from the angular constant -27π/8.

Your response: _____

Incoming: argument $10(x - 3\frac{\pi}{10})$; $h = 3\frac{\pi}{10}$

Rewrite $y = 2\cos(2\pi\frac{x-\frac{3}{2}}{9})$ using the sin reference while holding period and midline fixed. Track the signed coefficient and explain the quarter-cycle phase convention; for advanced cases give both same-sign and opposite-sign target representatives.

Your response: _____

AP Precalculus

Phase Shifts of Sine and Cosine

Name: _____ **Date:** _____ **Class:** _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Audit the proposed phase-shift claim. Normalize the argument, use the named event and signed family, and reduce representatives modulo the fixed period. Identify the first error or defend a valid noncanonical shift.

Given: domain: phase analysis with amplitude and period fixed; rule: $y = \sin(2x - \pi)$; student claim: shift right π

A student applies the horizontal shift to output values instead of translating the input landmarks with the stated sign. Diagnose the first mathematical error and state the correction. Then complete the original task: Translate every listed landmark of $y = \sin x$ horizontally by $h = \frac{\pi}{2}$. Complete the shifted coordinates, retain all y-values, and note that a plotting window may clip a landmark without changing the phase rule.

Required response

parent anchor	shifted x
x 0 **y** 0	_____
x $\frac{\pi}{2}$ **y** 1	_____
x π **y** 0	_____

Phase Shifts of Sine and Cosine

Full Worked Solutions - excerpt

Worked example

Problem. Rewrite the radian argument of y=cos((-7/2)x+21π/4) in the form b(x-h). State h in x-units and distinguish it from the angular constant 21π/4.

Answer. argument $-\frac{7}{2}(x-3\frac{\pi}{2})$; $h=3\frac{\pi}{2}$

Explanation and check.

Solve $-\frac{7}{2}(x-h)=(-\frac{7}{2})x+21\frac{\pi}{4}$. Since $h=-\frac{c}{b}, h=3\frac{\pi}{2}$; the inside constant itself is not the displacement unless $b=-1$.

Worked example

Problem. Rewrite the radian argument of y=cos(10x-3π) in the form b(x-h). State h in x-units and distinguish it from the angular constant -3π.

Answer. argument $10(x-3\frac{\pi}{10})$; $h=3\frac{\pi}{10}$

Explanation and check.

Solve $10(x-h)=10x-3\pi$. Since $h=-\frac{c}{b}, h=3\frac{\pi}{10}$; the inside constant itself is not the displacement unless $b=-1$.