	A	B
=		
1	a	-5
2	b	10
3	c	0
4	d	0
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

B3 0

Find period of y $=-5\cos(10x)$

period $= \dfrac{2\cdot\pi}{|b|}$

Period$=2\cdot\pi/(10) = 2\cdot\pi\cdot\dfrac{1}{10}$

$=\dfrac{\pi}{5}$ This is the length of the period of this function

One period of this function $[0,\dfrac{\pi}{5})$

minimum is the solution of $10x=0$ or

$x = \dfrac{-c}{b} = 0/(10) = 0\cdot\dfrac{1}{10} = 0$

maximum is the solution of $10x=2\cdot\pi$

$x = \dfrac{2\cdot\pi}{b} = (2\cdot\pi)/(10) = 2\cdot\pi/(10) = 2\cdot\pi\cdot\dfrac{1}{10} = \dfrac{\pi}{5}$

$y = -5\cos(10x)$

$a = -5$ tells us vertical reflection amplitude $= 5$

tells us dilation of amplitude

tells us vertical stretch

$b = 10$ tells us no horizontal reflection period $= \frac{\pi}{5}$

tells us dilation of period

tells us horizontal compression

$y = -5\cos(10x)$

finding the y coordinates for sine function is pretty basic when d =0

If NO VERTICAL SHIFT, then:

(begin, 0) (extreme x1, a) (middle, 0) (extreme x2, $-a$) (end, 0)

In this particular case we know $d = 0$, so we would find

(begin, $0 + -5$) (x intercept, 0) (middle, $0 - -5$) (x intercept, 0) (end, $0 + -5$)

(begin, -5) (x intercept, 0) (middle, 5) (x intercept, 0) (end, -5)

The more challenging thing to accomplish is to find the value of x for each of these y values

INFINITELY more challenging, to be precise!

$y = -5\cos(10x)$ BRUTE FORCE METHOD

Solve FIVE equations to find x coordinates Period= $\frac{\pi}{5}$ One period of this function $[0, \frac{\pi}{5})$

Equation 1

To find beginning of period solve this equation $10x=0$

$10x=0 \rightarrow 10x/10 = 0/10 \rightarrow x = 0 \cdot \frac{1}{10}$

Beginning of this period is x = 0

Equation 2

To find an x intercept of period solve this equation $10x=\frac{\pi}{2}$

$10x=\frac{\pi}{2} \rightarrow 10x=\frac{\pi}{2} \rightarrow 10x/10 = \frac{\pi}{2}/10 \rightarrow x = \frac{\pi}{2} \cdot \frac{1}{10}$

An extreme y coordinate of this period occurs at x = $\frac{\pi}{20}$

$y = -5\cos(10x)$ BRUTE FORCE METHOD Solve FIVEequations to find x coordinates

Period= $\frac{\pi}{5}$ One period of this function $[0, \frac{\pi}{5})$

Equation 3

To find middle of period solve this equation $10x = \pi$

$10x = \pi \rightarrow 10x = \pi \rightarrow 10x/10 = \pi/10 \rightarrow x = \pi \cdot \frac{1}{10}$

Middle of this period is $x = \frac{\pi}{10}$

Equation 4

To find an x intercept of period solve this equation $10x = \frac{3\pi}{2}$

$10x = \frac{3\pi}{2} \rightarrow 10x/10 = \frac{3 \cdot \pi}{2}/10 \rightarrow x = \frac{3 \cdot \pi}{2} \frac{1}{10}$

An extreme y coordinate of this period occurs at $x = \frac{3 \cdot \pi}{20}$

$y = -5\cos(10x)$ BRUTE FORCE METHOD Solve FIVE equations to find x coordinates

Period= $\frac{\pi}{5}$ One period of this function $[0, \frac{\pi}{5})$

Equation 5

To find end of period solve this equation $10x = 2\pi$

$10x = 2\pi \rightarrow 10x/10 = 2\cdot\pi/10 \rightarrow x = 2\cdot\pi\cdot\frac{1}{10}$

End of this period is $x = \frac{\pi}{5}$

We already found y coordinates

FIVE ASSOCIATED POINTS with this transformation of sine

$(0, -5)$ $(\frac{\pi}{20}, 0)$ $(\frac{\pi}{10}, 5)$ $(\frac{3\cdot\pi}{20}, 0)$ $(\frac{\pi}{5}, -5)$

$y = -5\cos(10x)$ COOL STUFF METHOD

Period$=\frac{\pi}{5}$ $\frac{1}{4}$ of Period $=\frac{\pi}{5}\cdot\frac{1}{4}=\frac{\pi}{20}$ COOL STUFF NUMBER

One period of this function $[0,\frac{\pi}{5})$

We know the period starts at $x=0$ and we know at each quarter of the period, something important occurs $x=0$

$$x=0+1\cdot\frac{\pi}{20}=\frac{\pi}{20}$$

$$x=0+2\cdot\frac{\pi}{20}=\frac{\pi}{10}$$

$$x=0+3\cdot\frac{\pi}{20}=\frac{3\cdot\pi}{20}$$

$$x=0+4\cdot\frac{\pi}{20}=\frac{\pi}{5}$$

$y = -5\cos(10x+0)+0$ $\quad$ $y = -5\cos(10(x+0))+0$ MIDPOINT METHOD

Period= $\frac{\pi}{5}$ One period of this function $[0, \frac{\pi}{5})$

We know the period starts at x $=0$

We also know the period length so we know the end of period x $=0+\frac{\pi}{5}=\frac{\pi}{5}$

If we average the beginning and end we get the middle

middle of period x= $\frac{1}{2}\cdot(0+\frac{\pi}{5})=\frac{1}{2}\cdot(\frac{\pi}{5})=\frac{\pi}{10}$

If we average the beginning and middle we get an extreme y value's x coordinate

1/4 of period x= $\frac{1}{2}\cdot(0+\frac{\pi}{10})=\frac{1}{2}\cdot(\frac{\pi}{10})=\frac{\pi}{20}$

If we average the end and middle we get an extreme y value's x coordinate

3/4 of period x= $\frac{1}{2}\cdot(\frac{\pi}{5}+\frac{\pi}{10})=\frac{1}{2}\cdot(\frac{3\cdot\pi}{10})=\frac{3\cdot\pi}{20}$

$y = -5\cos(10x)$ period $= \frac{2\cdot\pi}{|b|} = \frac{\pi}{5}$

beginning of the implied period

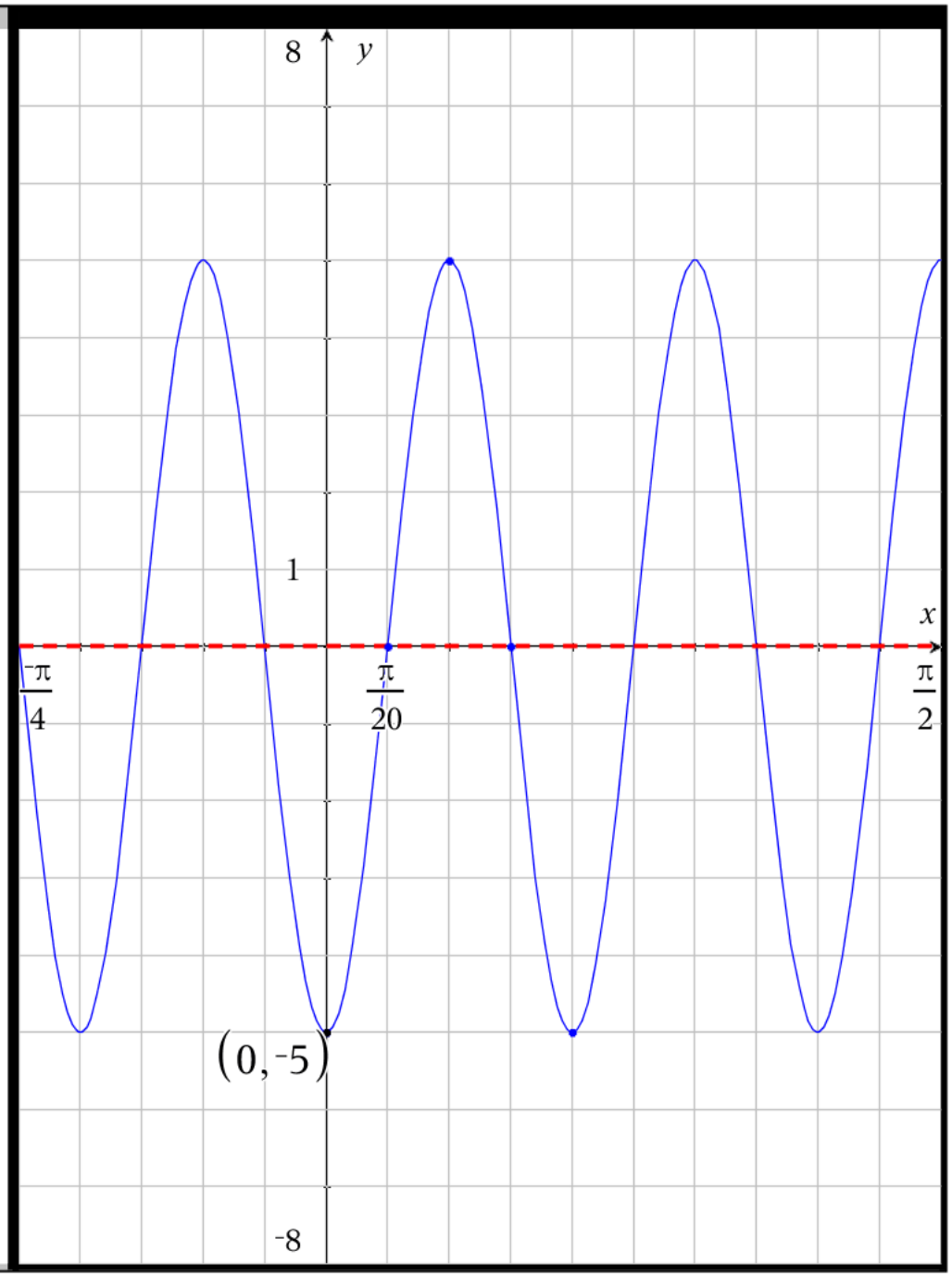
In general $x = \frac{-c}{b}$

In this case, some would say that this is a particular example $x = 0$

In general $\left(\frac{-c}{b}, f\left(\frac{-c}{b}\right)\right) = \left(\frac{-c}{b}, d\right)$

Associated point with the beginning of the transformed period

$(0, f(0)) = (0, -5)$



$y = {}^{-}5\cos(10x)$ period $= \dfrac{2\cdot\pi}{|b|} = \dfrac{\pi}{5}$

end of first quarter of the implied period

In general $x = \dfrac{{}^{-}c}{b} + \dfrac{\pi}{2\cdot|b|}$

In this case, some would say that this is a

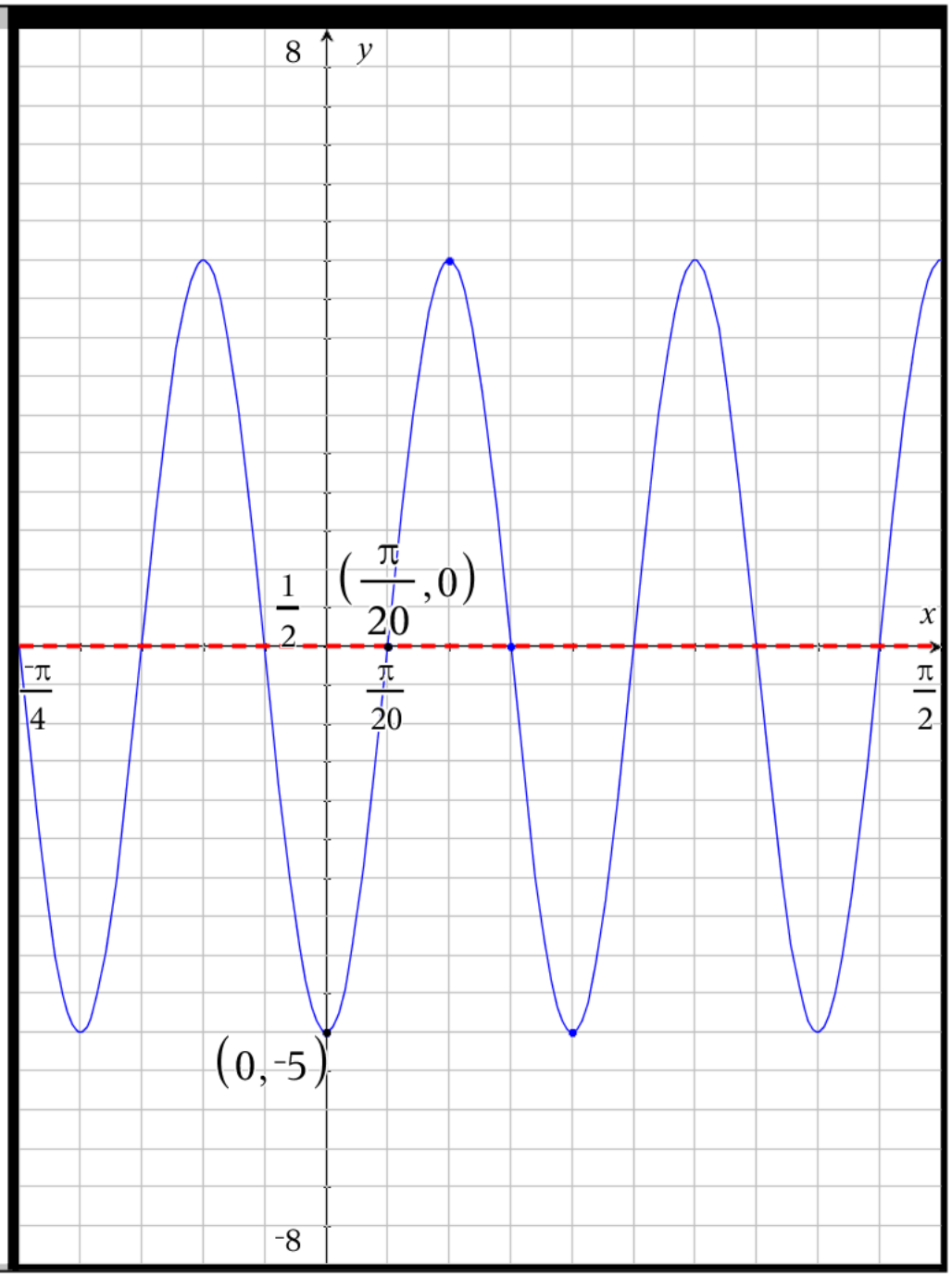
particular example $x = \dfrac{\pi}{20}$

In general $\left(\dfrac{{}^{-}c}{b} + \dfrac{\pi}{2\cdot|b|}, f\left(\dfrac{{}^{-}c}{b} + \dfrac{\pi}{2\cdot|b|}\right)\right)$

$= \left(\dfrac{{}^{-}c}{b} + \dfrac{\pi}{2\cdot|b|}, d+a\right)$

Associated point with the end of the first quarter of the transformed period

$\left(\dfrac{\pi}{20}, f\left(\dfrac{\pi}{20}\right)\right) = \left(\dfrac{\pi}{20}, 0\right)$



$y = {}^{-}5\cos(10x+0)+0$ period $= \frac{2\cdot\pi}{|b|} = \frac{\pi}{5}$

end of first half of the implied period

In general $x = \frac{{}^{-}c}{b} + \frac{\pi}{|b|}$

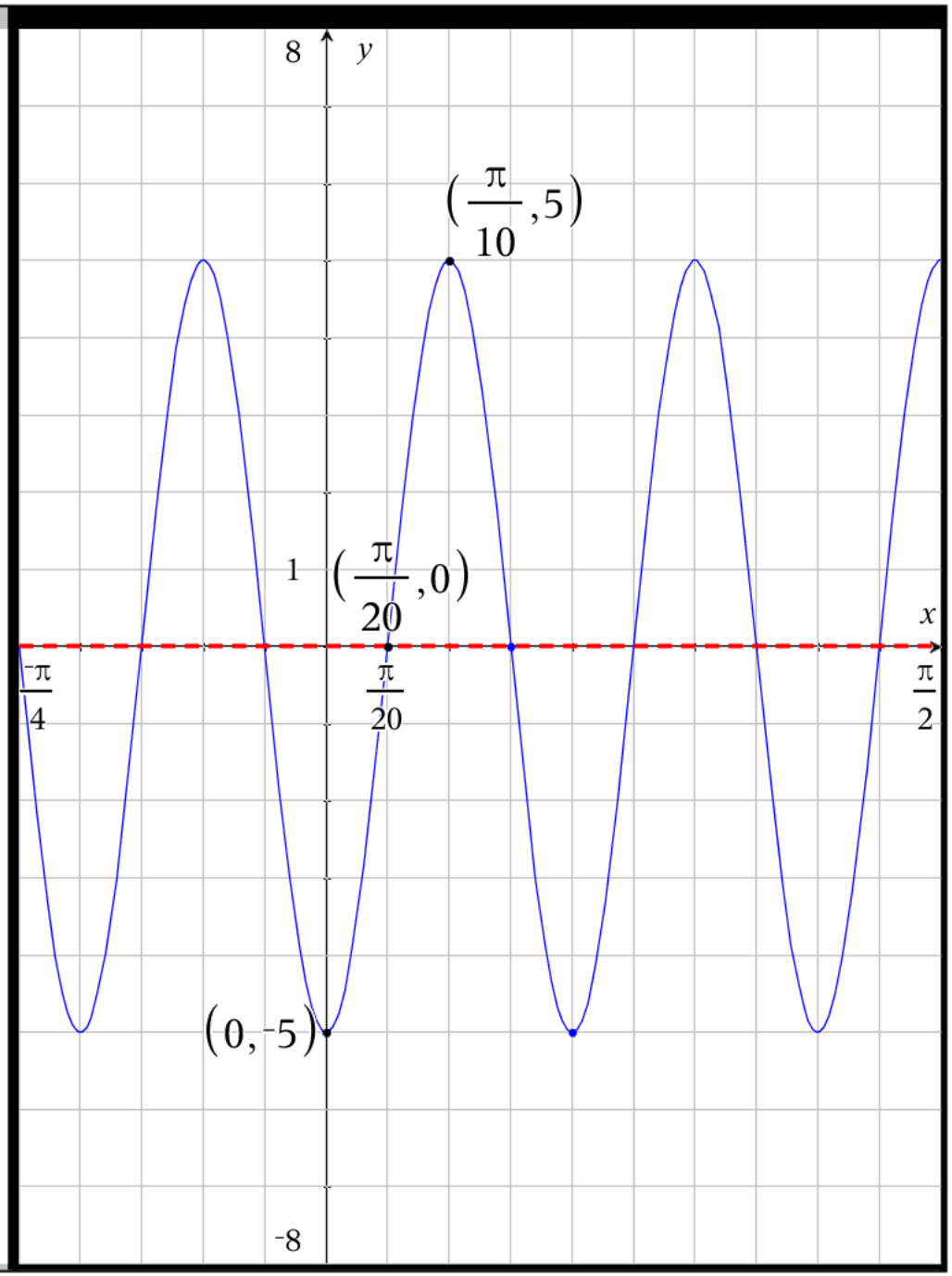
In this case, some would say that this is a particular example $x = \frac{\pi}{10}$

In general $\left(\frac{{}^{-}c}{b} + \frac{\pi}{|b|}, f\left(\frac{{}^{-}c}{b} + \frac{\pi}{|b|}\right)\right)$

$= \left(\frac{{}^{-}c}{b} + \frac{\pi}{|b|}, d\right)$

Associated point with the end of the first half of the transformed period

$\left(\frac{\pi}{10}, f\left(\frac{\pi}{10}\right)\right) = \left(\frac{\pi}{10}, 5\right)$



$y = {}^{-}5\cos(10x+0)+0$ period $= \frac{2\cdot\pi}{|b|} = \frac{\pi}{5}$

end of first three quarters of the implied period

In general $x = \frac{{}^{-}c}{b} + \frac{3\pi}{2|b|}$

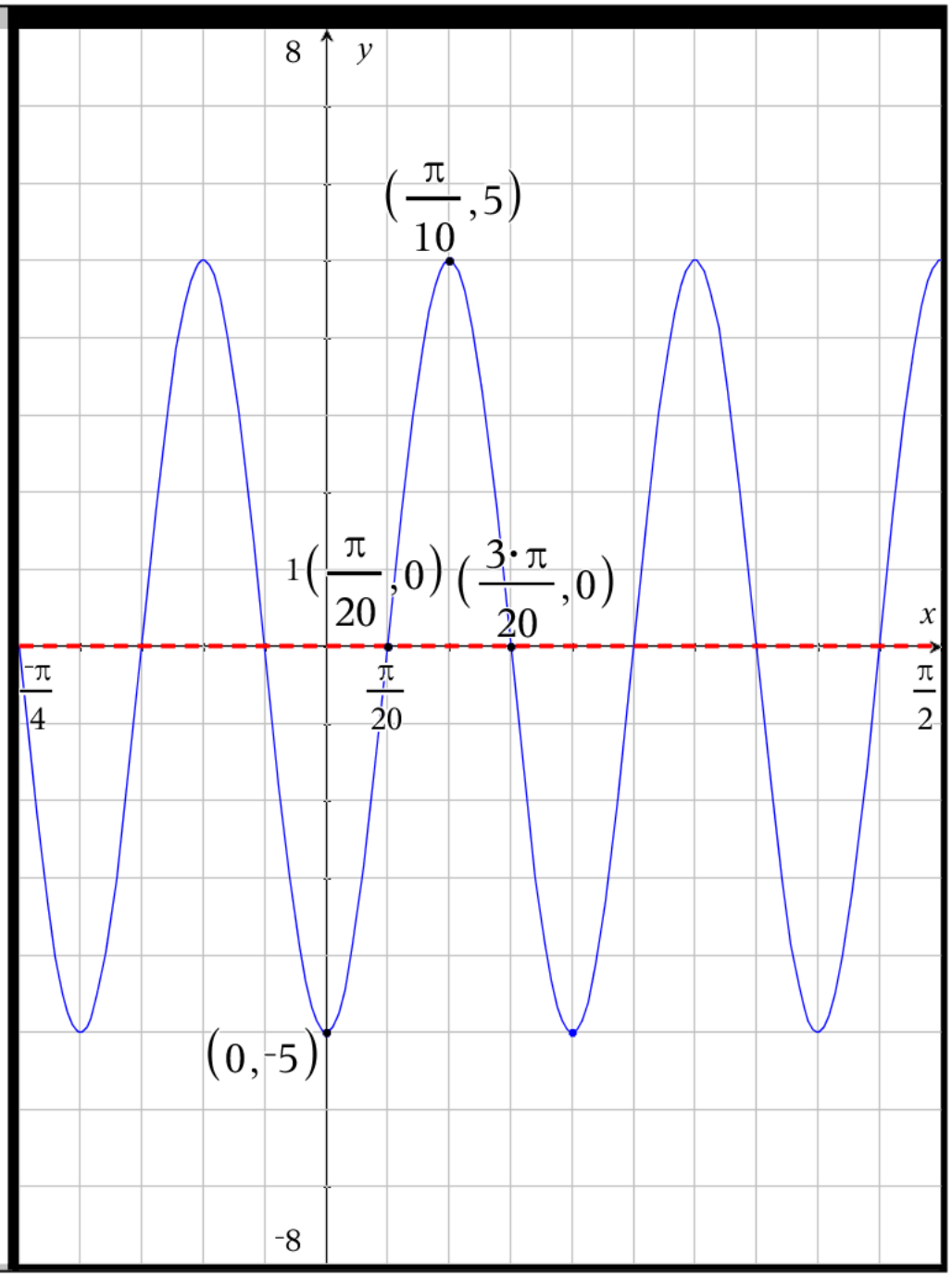
In this case, some would say that this is a particular example $x = \frac{\pi}{10}$

In general $\left(\frac{{}^{-}c}{b} + \frac{3\pi}{2|b|}, f\left(\frac{{}^{-}c}{b} + \frac{3\pi}{2|b|}\right)\right)$

$= \left(\frac{{}^{-}c}{b} + \frac{3\pi}{2|b|}, d-a\right)$

Associated point with the end of the first three quarters of the transformed period

$\left(\frac{3\cdot\pi}{20}, f\left(\frac{3\cdot\pi}{20}\right)\right) = \left(\frac{3\cdot\pi}{20}, 0\right)$



$y = {}^{-}5\cos(10x+0)+0$ period $= \frac{2\cdot\pi}{|b|} = \frac{\pi}{5}$

end of of the implied period

In general $x = \frac{{}^{-}c}{b} + \frac{2\pi}{|b|}$

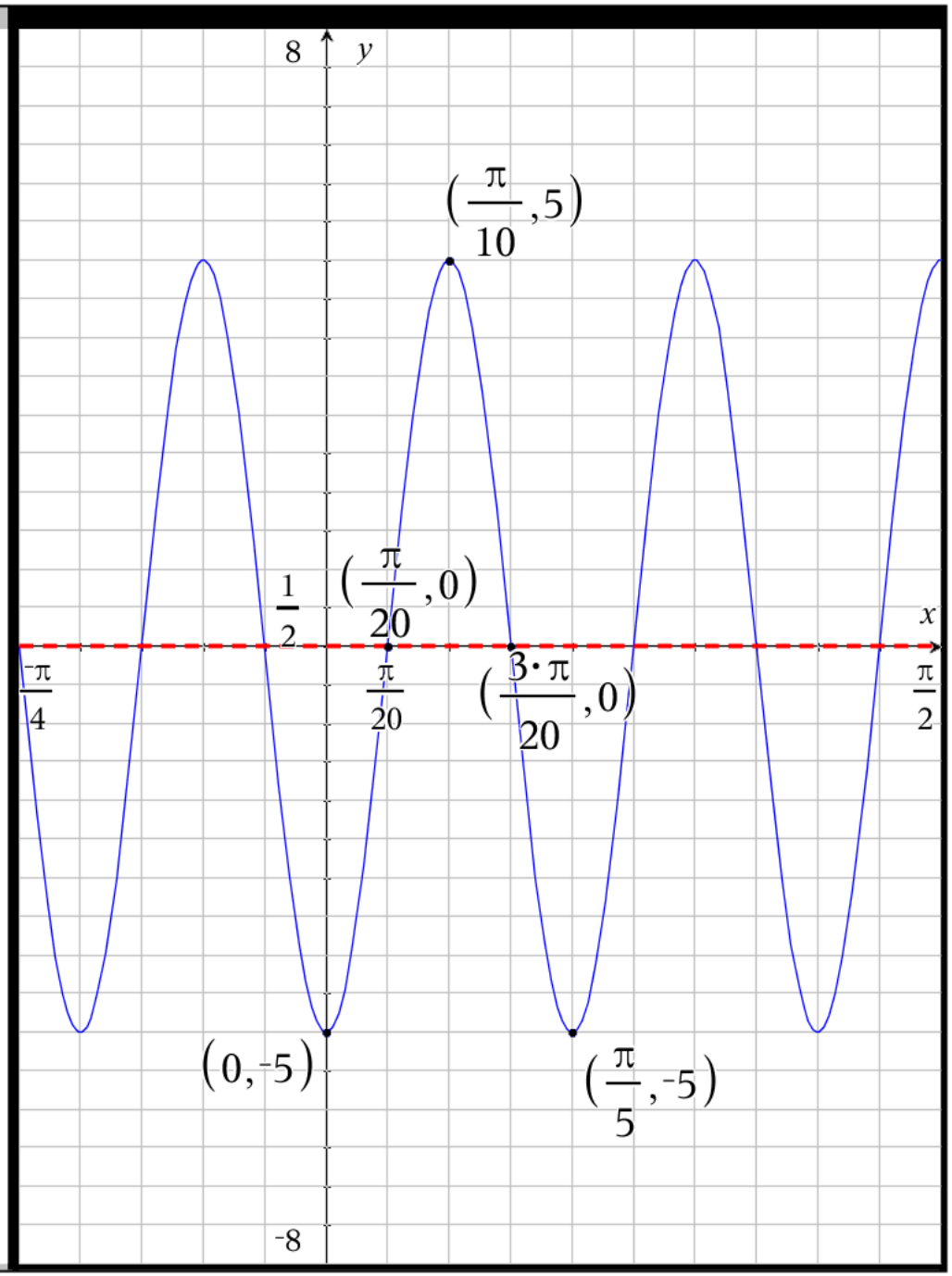
In this case, some would say that this is a particular example $x = \frac{\pi}{5}$

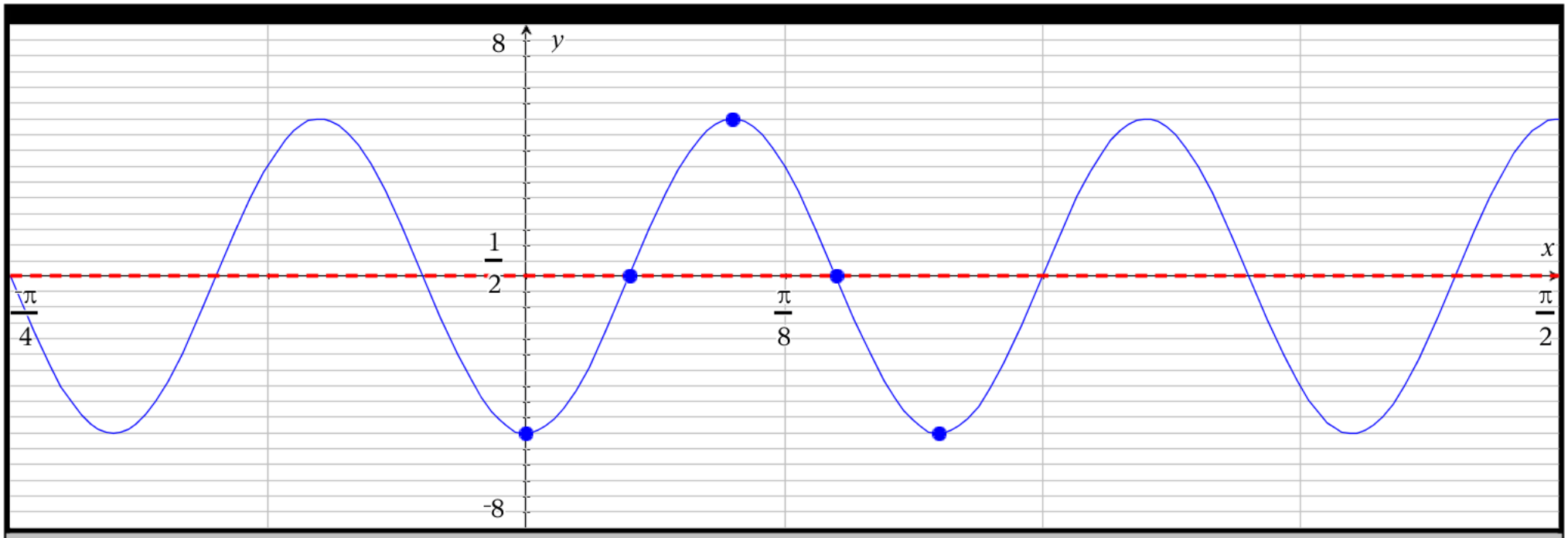
In general $\left(\frac{{}^{-}c}{b} + \frac{2\pi}{|b|}, f\left(\frac{{}^{-}c}{b} + \frac{2\pi}{|b|}\right)\right)$

$= \left(\frac{{}^{-}c}{b} + \frac{2\pi}{|b|}, d\right)$

Associated point with the end of the transformed period

$\left(\frac{\pi}{5}, f\left(\frac{\pi}{5}\right)\right) = \left(\frac{\pi}{5}, {}^{-}5\right)$



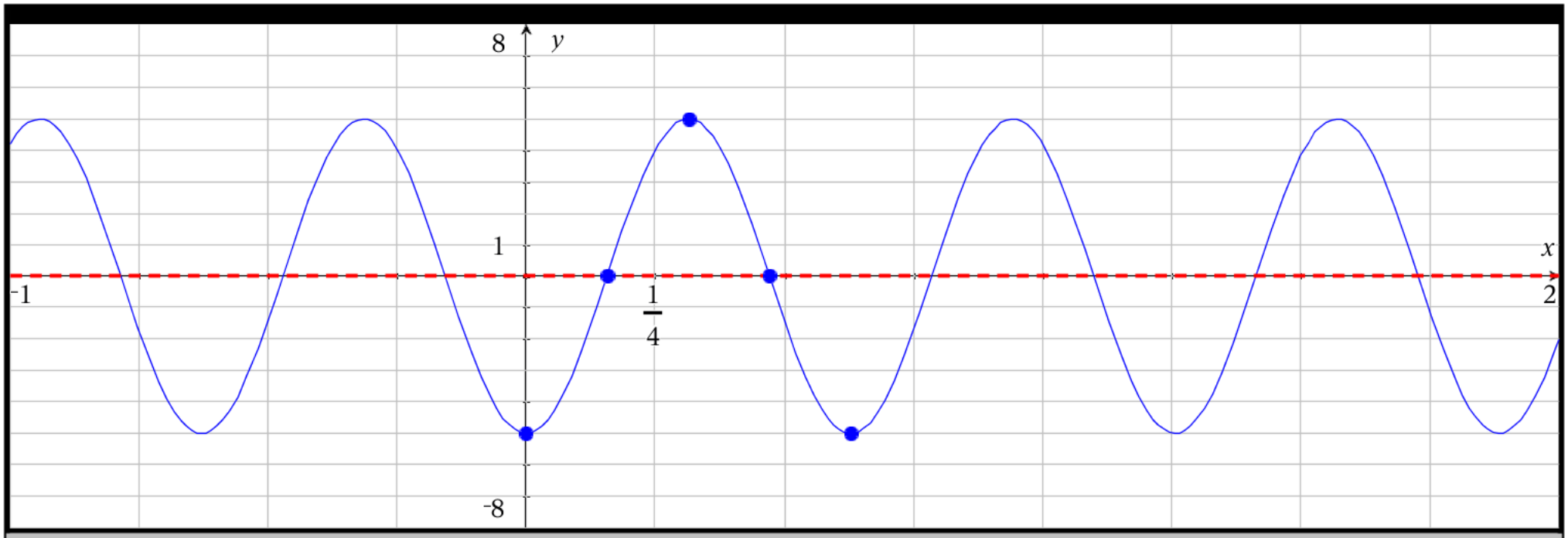


y = $-5\cos(10x)$ Domain: $\mathbb{R}$ Range: This graph has a range of $[-5, 5]$

This graph has a period of $[0, \frac{\pi}{5})$ This graph has an amplitude of 5

This graph has phase shift of 0 This graph has a midline of y=0

Five points $\{ (0, -5), (\frac{\pi}{20}, 0), (\frac{\pi}{10}, 5), (\frac{3\cdot\pi}{20}, 0), (\frac{\pi}{5}, -5)\}$



$y = -5\cos(10x)$ Domain: $\mathbb{R}$ Range: This graph has a range of $[-5, 5]$

This graph has a period of $[0, \frac{\pi}{5})$ This graph has an amplitude of 5

This graph has phase shift of 0 This graph has a midline of $y=0$

Five points $\{ (0, -5), (\frac{\pi}{20}, 0), (\frac{\pi}{10}, 5), (\frac{3\cdot\pi}{20}, 0), (\frac{\pi}{5}, -5)\}$