Name:_____

# SM3 7.3: Graphing Tangent & Cotangent

*Problems:*

Identify the period and first asymptote on the positive side of the x-axis.

1) $y = 2\tan x$
per: $\pi$, asym: $x = \frac{\pi}{2}$

2) $f(x) = 3\cot(x)$
per: $\pi$, asym: $x = \pi$

3) $f(x) = \tan\left(\frac{1}{2}x\right)$
per: $\frac{\pi}{1/2} = 2\pi$, asym: $x = \pi$

4) $y = \cot(2x)$
per: $\frac{\pi}{2}$, asym: $x = \frac{\pi}{2}$

5) $y = \tan(x) - 3$
per: $\pi$, asym: $x = \frac{\pi}{2}$

6) $h(x) = 1 - 4\cot(x)$
per: $\pi$, asym: $x = \pi$

7) $g(x) = \tan\left(x - \frac{\pi}{3}\right)$
per: $\pi$, asym: $x = \frac{5\pi}{6}$

8) $f(x) = \cot\left(4x + \frac{\pi}{2}\right)$
per: $\frac{\pi}{4}$, asym: $x = \frac{\pi}{8}$

Describe how changes in the given variable change the shape of the tangent curve:

$$y = a\tan\big(b(x-h)\big) + k$$

9) $k = 2$
shift up 2

10) $k = -\frac{1}{3}$
shift down $\frac{1}{3}$

11) $a = 2$
stretched it by 2

12) $a = \frac{1}{3}$
shrunk it by $\frac{1}{3}$

13) $b = 2$
twice as many curves

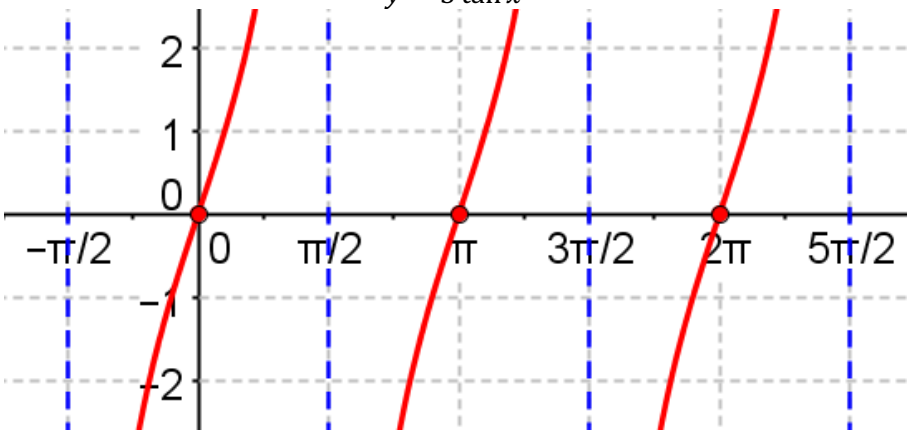
14) $b = \frac{1}{3}$
$\frac{1}{3}$ as many curves

15) $h = \pi$
shift right by $\pi$

16) $h = -\frac{\pi}{4}$
shift left by $\frac{\pi}{4}$

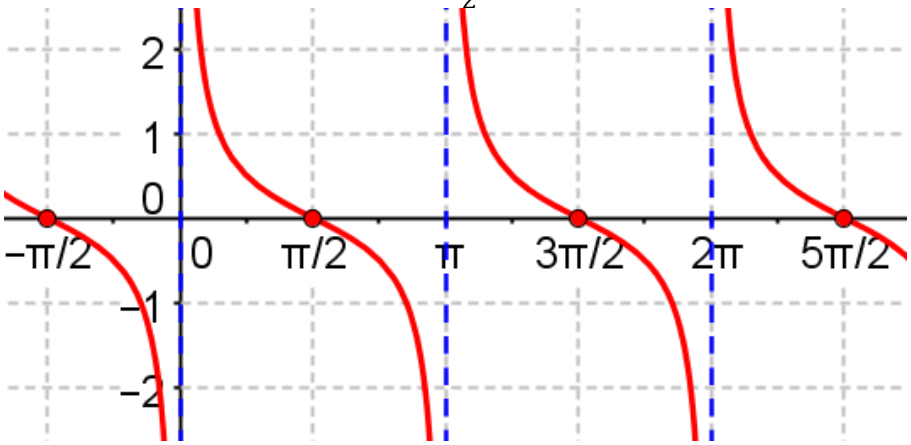
Sketch an appropriate coordinate axis and graph two periods of the function.

17) $y = 3\tan x$



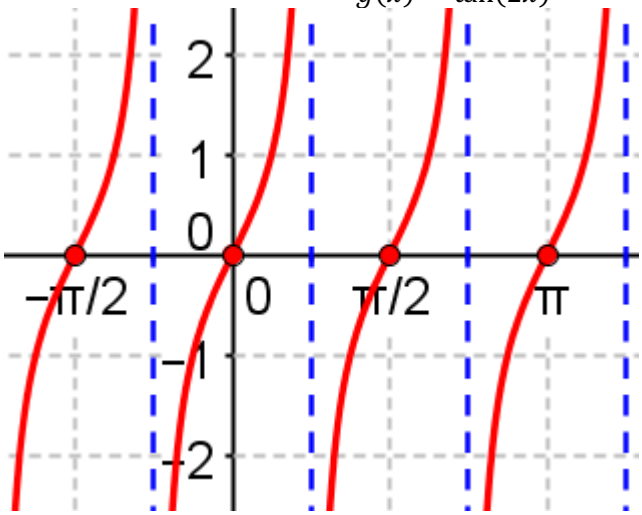

| | |
|---|---|
| Per: | $\pi$ |
| P.S.: | 0 |
| V.S.: | 0 |
| Scale: | $\frac{\pi}{2}$ |

18) $f(x) = \frac{1}{2}\cot x$



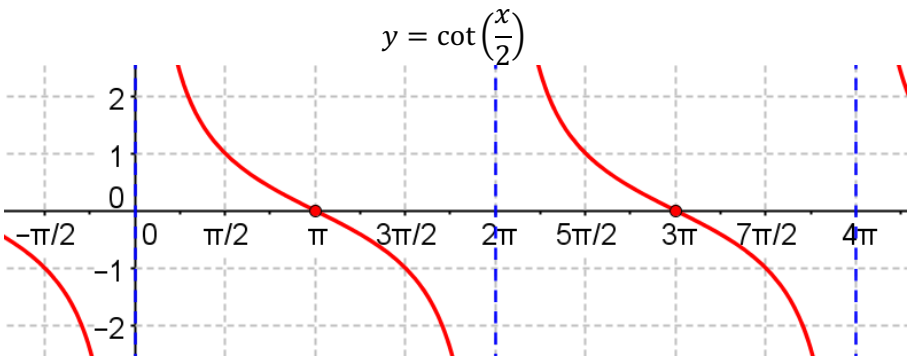

| | |
|---|---|
| Per: | $\pi$ |
| P.S.: | 0 |
| V.S.: | 0 |
| Scale: | $\frac{\pi}{2}$ |

19) $g(x) = \tan(2x)$



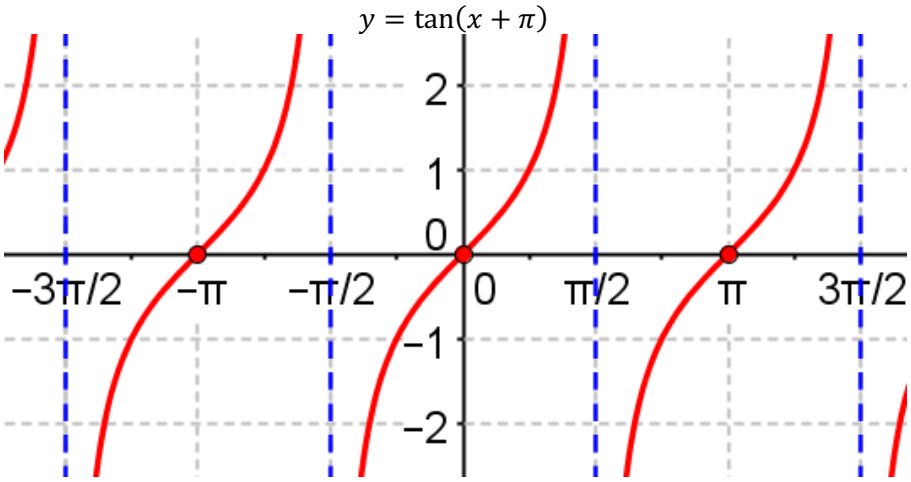

| | |
|---|---|
| Per: | $\frac{\pi}{2}$ |
| P.S.: | 0 |
| V.S.: | 0 |
| Scale: | $\frac{\pi}{4}$ |

20)



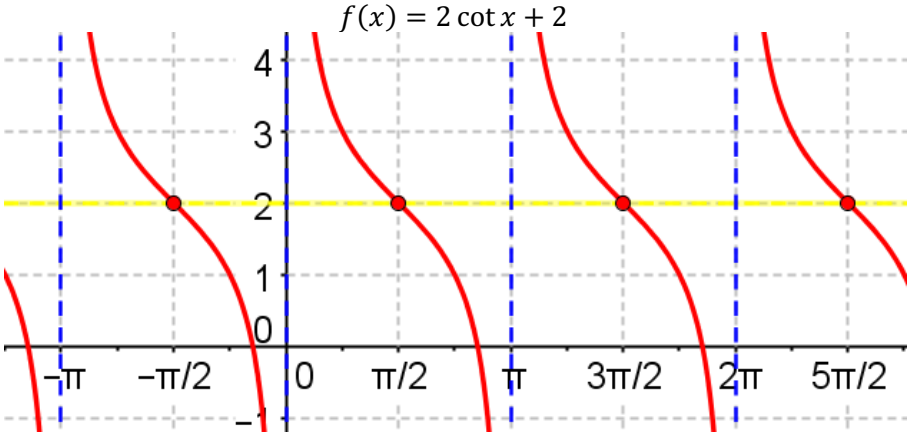

| | |
|---|---|
| Per: | $2\pi$ |
| P.S.: | $0$ |
| V.S.: | $0$ |
| Scale: | $\pi$ |

21)



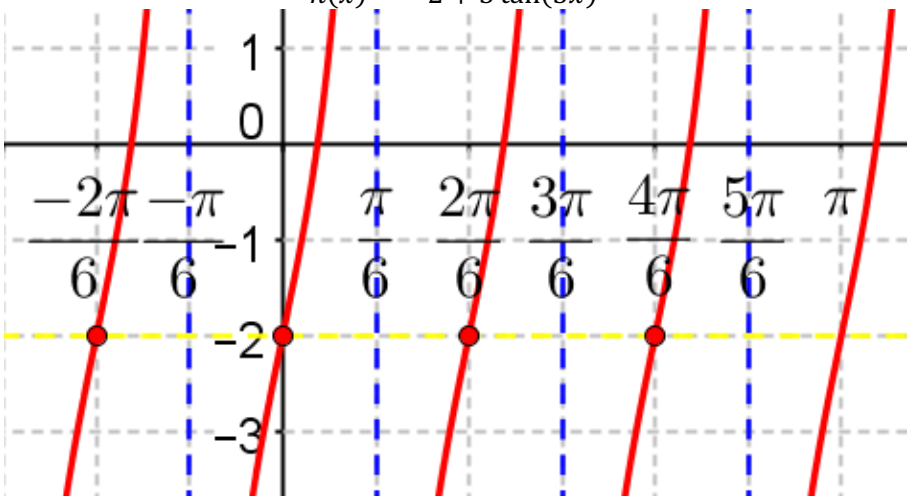

| | |
|---|---|
| Per: | $\pi$ |
| P.S.: | $\leftarrow \pi$ |
| V.S.: | $0$ |
| Scale: | $\frac{\pi}{2}$ |

22)



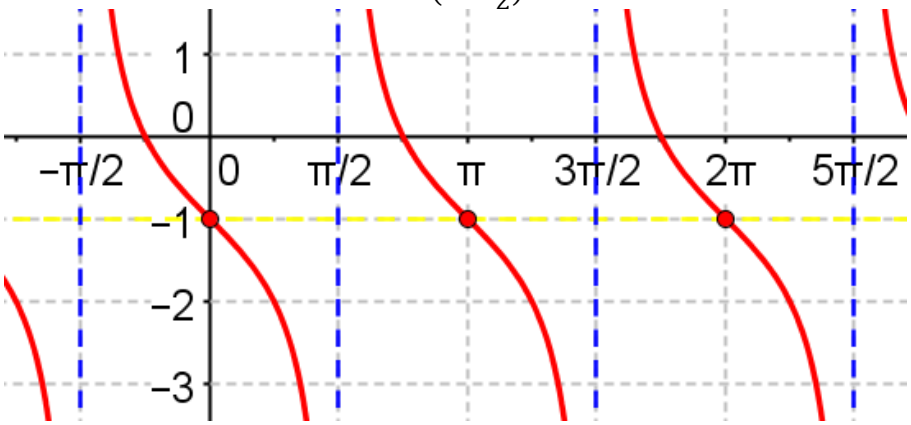

| | |
|---|---|
| Per: | $\pi$ |
| P.S.: | $0$ |
| V.S.: | $2$ |
| Scale: | $\frac{\pi}{2}$ |

23) $h(x) = -2 + 3\tan(3x)$



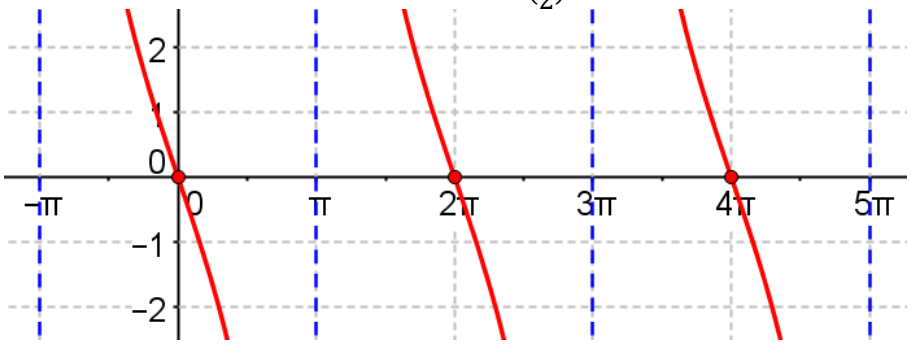

| | |
|---|---|
| Per: | $\frac{\pi}{3}$ |
| P.S.: | $0$ |
| V.S.: | $-2$ |
| Scale: | $\frac{\pi}{6}$ |

24) $y = \cot\left(x - \frac{\pi}{2}\right) - 1$



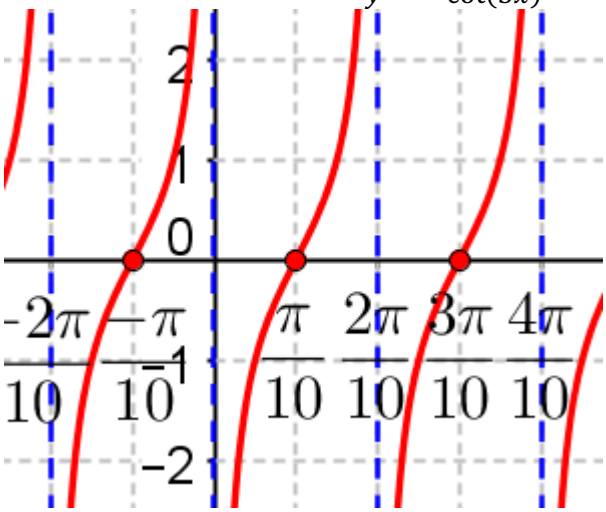

| | |
|---|---|
| Per: | $\pi$ |
| P.S.: | $\rightarrow \frac{\pi}{2}$ |
| V.S.: | $-1$ |
| Scale: | $\frac{\pi}{2}$ |

25) $g(x) = -4\tan\left(\frac{x}{2}\right)$



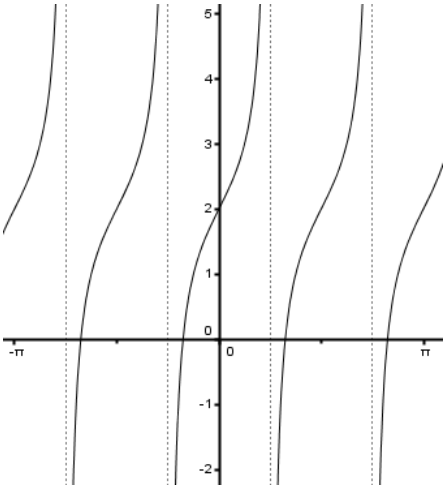

| | |
|---|---|
| Per: | $2\pi$ |
| P.S.: | $0$ |
| V.S.: | $0$ |
| Scale: | $\pi$ |

26) $y = -\cot(5x)$



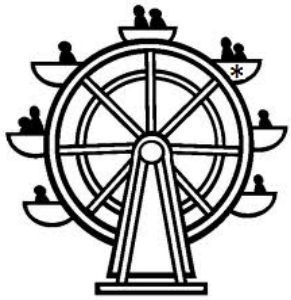

| | |
|---|---|
| Per: | $\frac{\pi}{5}$ |
| P.S.: | $0$ |
| V.S.: | $0$ |
| Scale: | $\frac{\pi}{10}$ |

27) Write the simplest form of the tangent function for the given graph.




$y = \tan(2x) + 2$

*Review and application*: Answer the questions about the situation:



A ferris wheel with 8 carriages has a radius of 40 feet. The wheel spins at a rate of 2.5 revolutions per minute. The bottom of the wheel has a clearance of 8 feet above the ground.

Monica and Shelly climb into a carriage at the bottom position using a retractable stair case.

28) Fill out the time and height values in the table, indicating how far the girls are from the ground $t$ seconds after the ferris wheel begins moving (use $t$ values that correspond to the carriage positions shown in the graphic):

| Time ($t$): | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Displacement: | 8 | $48-20\sqrt{2}$ | 48 | $48+20\sqrt{2}$ | 88 | $48+20\sqrt{2}$ | 48 | $48-20\sqrt{2}$ | 8 |

29) What is the amplitude of the wave that represents the height of a carriage on the ferris wheel (include units)?

$$40\ ft$$

30) As the wheel moves, it follows the points of a trigonometric curve. Which trigonometric function describes the height of a carriage without needing a phase shift: $\sin x$, $-\sin x$, $\cos x$, $or\ -\cos x$?

$$-\cos x$$

31) Use the formula $Period = \frac{2\pi}{b}$ to determine an appropriate value for (b):

$$b = \frac{\pi}{12}$$

32) How far is the wheel from the ground?

$$8\ ft$$

33) Write a trigonometric function that accurately describes the height of the wheel as a function of time:

$$H(t) = -40\cos\left(\frac{\pi}{12}t\right) + 48$$