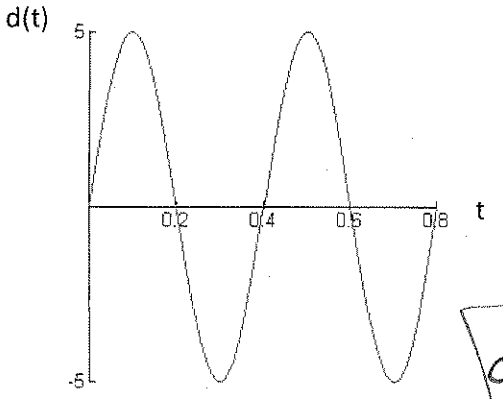
PC – Trig

Name KEY

# Applying Trigonometric Functions

1) The graph below gives the displacement $d(t)$ at time $t$ of an object. Find a formula for the function $d(t)$.



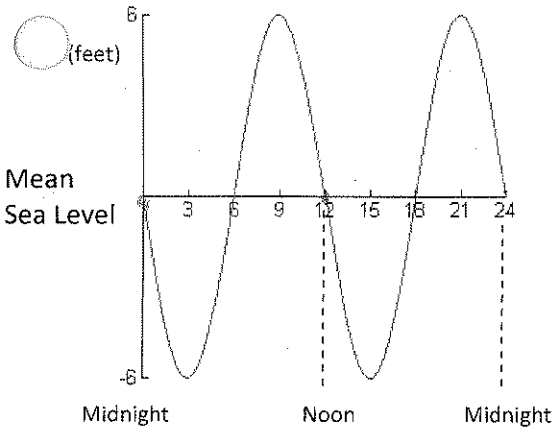

$\text{Period} = \frac{2\pi}{b} = 0.4$

$b = \frac{2\pi}{0.4} = 5\pi$

$a = 5$

$d(t) = 5\sin 5\pi t$

2) The graph shows the variation of the water level relative to mean sea level in Commencement Bay at Tacoma, Washington, for a particular 24-hour period. Find an equation that describes the variation in water level as a function of the number of hours after midnight.




$\frac{2\pi}{b} = 12 \Rightarrow \frac{2\pi}{12} = b$

$b = \frac{\pi}{6}$

$a = 6$

$H(t) = -6\sin\left(\frac{\pi}{6}t\right)$

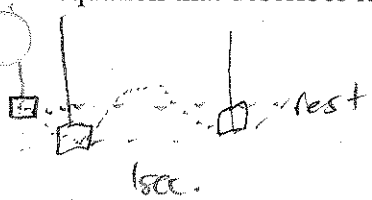
3) The Bay of Fundy in Nova Scotia has the highest tides in the world. In one 12-hour period, the water starts at mean sea level, rises to 21 feet above, drops to 21 feet below, and then returns to mean sea level. Find an equation that describes the height of the tide in the Bay of Fundy above sea level.

$b = \frac{\pi}{6}$

$a = 21$

$H(t) = 21\sin\left(\frac{\pi}{6}t\right)$

4) A mass suspended from a spring is pulled down a distance of 2 feet from its rest position. The mass is released at time t = 0 and allowed to oscillate. If the mass returns to this position after 1 second, find an equation that describes its motion.




$\frac{2\pi}{b} = 1$ $\quad \frac{2\pi}{1} = b$

$a = 2$

$d(t) = -2\cos 2\pi t$

5) A mass is suspended on a spring. The spring is compressed so that the mass is located 5 cm above its rest position. The mass is released at time t = 0 and allowed to oscillate. It is observed that the mass reaches its lowest point ½ second after it is released. Find an equation that describes the motion of the mass.

$\frac{2\pi}{b} = 1$ $\quad b = 2\pi$

$a = 5$

$d(t) = 5\cos 2\pi t$

6) A ferris wheel has a radius of 10 m, and the bottom of the wheel passes 1 m above the ground. If the ferris wheel makes one complete revolution every 20 s, find an equation that gives the height above the ground of a person on the ferris wheel as a function of time. Assume that the person begins the ride at the bottom of the ferris wheel.


$1 \text{ rev} = 20\text{s}$

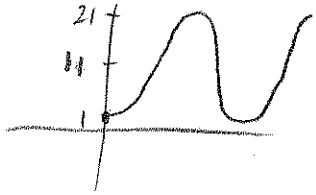
$\frac{2\pi}{20} = \frac{20\text{s}}{20}$

$b = \frac{\pi}{10}$

$a = 11$

$d(t) = 11 - 10\cos\left(\frac{\pi}{10}t\right)$

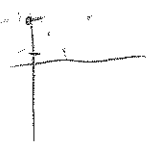
$d(t) = 11 + 10\sin\left(\frac{\pi}{10}t\right)$



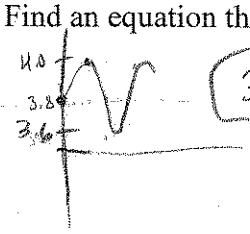

7) The variable star Zeta Gemini has a period of 10 days. The average brightness of the star is 3.8 magnitudes, and the maximum variation from average is 0.2 magnitudes. Find an equation that gives the brightness of the star as a function of time.

$\frac{2\pi}{b} = 10$

$b = \frac{\pi}{5}$



Period = 10 days

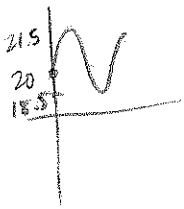



$3.8 + 0.2\sin\frac{\pi}{5}t$

8) Astronomers believe that the radius of a variable star increases and decreases with the brightness of the star. The variable star Delta Cephei has an average radius of 20 million miles and changes by a maximum of 1.5 million miles from this average during a single pulsation. If the time between periods of maximum brightness is 5.4 days, find an equation that describes the radius of this star as a function of time.

$\frac{2\pi}{b} = 5.4$

$b = \frac{10\pi}{27}$




$20 + 1.5\sin\frac{10\pi}{27}t$