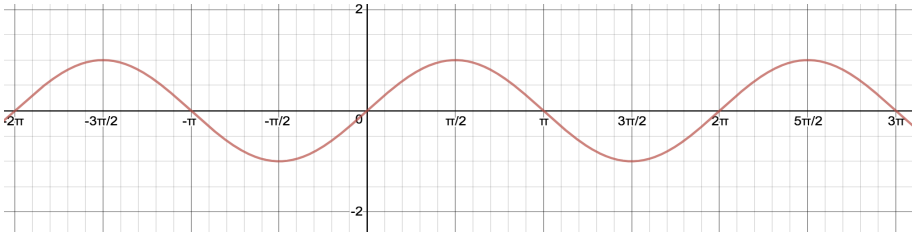
Name: _____

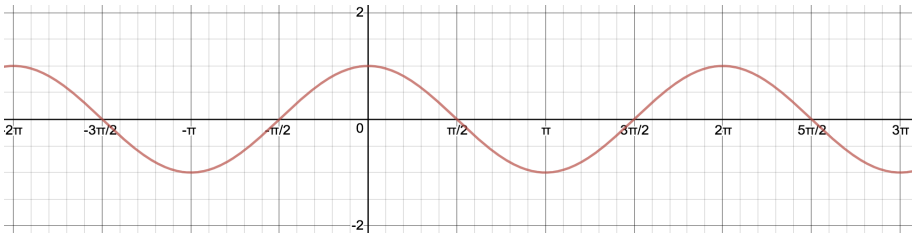
3.5 Derivatives of Trigonometric Functions

Warm-up: Compute the following derivatives:

1. $\dfrac{d}{dt}\left(\dfrac{x^2}{2^{3x}}\right)$
2. $\dfrac{d}{dx}\left(\sin\left(xe^x\right)\right)$

1. Sketch a derivative function for each of the functions shown below. What do you notice?





Derivatives of Trigonometric Functions

(a) $\dfrac{d}{d\theta}\sin(\theta) =$

(b) $\dfrac{d}{d\theta}\cos(\theta) =$

(c) $\dfrac{d}{d\theta}\tan(\theta) =$

(d) $\dfrac{d}{d\theta}\csc(\theta) =$

(e) $\dfrac{d}{d\theta}\sec(\theta) =$

(f) $\dfrac{d}{d\theta}\cot(\theta) =$

2. Compute the following derivatives.

   (a) $\dfrac{d}{d\theta}\left[\theta \tan\theta\right]$

   (b) $\dfrac{d}{dx}\left[\cos^2(x)\right]$

   (c) $\dfrac{d}{dt}\left[\sin\left(3^t\right)\cos\left(2^t\right)\right]$

3. The depth, y, in feet, of water in Newport Harbor is given in terms of t, the number of hours since midnight, by

$$y = 5 + 4.9\cos\left(\frac{\pi}{6}t\right).$$

   (a) Find $\dfrac{dy}{dt}$. What does $\dfrac{dy}{dt}$ represent, in terms of water level?

   (b) For $0 \le t \le 24$, when is $\dfrac{dy}{dt}$ zero? Explain what it means (in terms of water level) for $\dfrac{dy}{dt}$ to be zero.