Name(s):

1. A particle has a displacement at time t of $s(t) = t \sin t$.

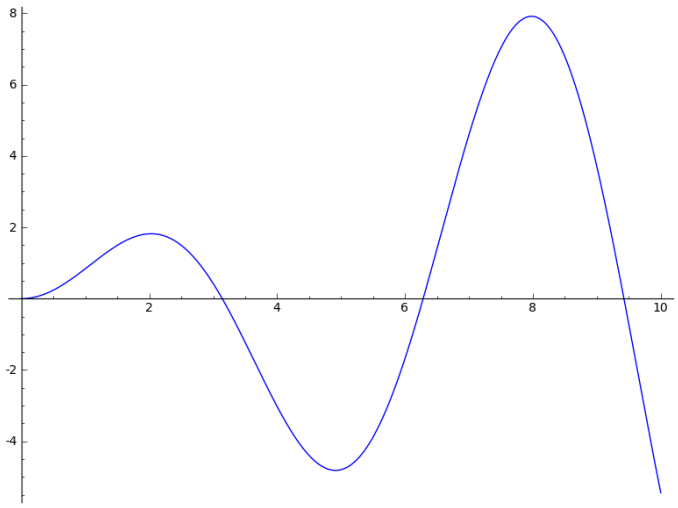
a) Differentiate $s(t)$ to find the velocity of the particle at time t.

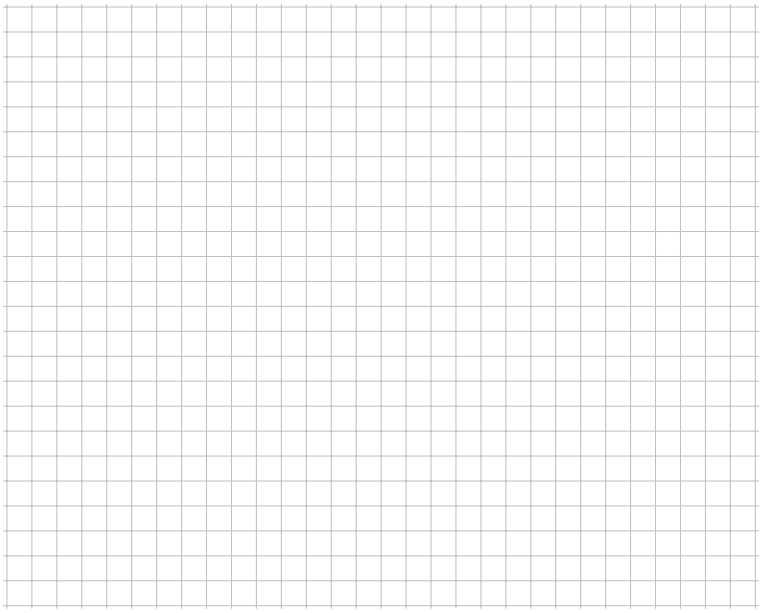
b) Differentiate again to find the acceleration of the particle at time t.

c) Fill in the table below with the missing values.

t	s(t)	s'(t)	s"(t)
0	0	0	2
$\frac{\pi}{2}$			
π			
$\frac{3\pi}{2}$			
2π			
$\frac{5\pi}{2}$			
3π			
$\frac{7\pi}{2}$			

2. The graph $y = t \sin t$ is shown below. Use this graph and your answers to problem 1 to help sketch the graphs of $s'(t)$ (and $s''(t)$ if you feel ambitious).





3. Our goal here is to find a formula for $\dfrac{d}{dx}\left[(2x+1)^n\right]$ when n is a positive integer.

a) Find $\dfrac{d}{dx}\left[(3x+1)^2\right]$ using $(3x+1)^2 = (3x+1)(3x+1)$ and the product rule.

b) Find $\dfrac{d}{dx}\left[(3x+1)^3\right]$ using $(3x+1)^3 = (3x+1)(3x+1)^2$, the product rule, and your solution to part a.

c) Find $\dfrac{d}{dx}\left[(3x+1)^4\right]$ using $(3x+1)^4 = (3x+1)(3x+1)^3$, the product rule, and your solution to part b.

d) Try to find a formula for $\dfrac{d}{dx}\left[(3x+1)^n\right]$.