

Worksheet 5

SI with Ian

Week of March 3rd

Feel free to use notes and other resources, however, please do not use online calculators. Also if you are printing this worksheet out before hand (thank you) please wait to complete the worksheet until the SI session.

1 Session Problems

1 Differentiate $Z(v) = \frac{v + \tan(4 + 10v)}{1 + \csc(v)}$

2 Find the equation of the tangent line to the curve $y = 2x\sin(x)$ at the point $(\frac{\pi}{2}, \pi)$

3 Find the equation of the tangent line to the curve $f(x) = 4\sqrt{2x} - 6e^{2-\pi}$ at $x = 2$.

In a 7th grade science fair a student is making a bottle rocket demonstration. The bottle rocket is shot from the ground with an initial velocity of 27m/s and is modeled by the equation $s(t) = -0.9t^2 + 27t$

- What is the velocity of the rocket at time t ?
- What is the position of the bottle rocket after 2 seconds?
- When does the rocket reach its max height?
- What is the rocket's max height?
- When does the rocket return back to the ground?
- What is the rocket's velocity immediately before reaching the ground?
- When is the rocket's speed increasing?

2 Challenge Problems

An object is dropped from the second-highest floor of the Sears Tower, 1,542 feet off the ground.

- Construct the position and velocity equations for the object in terms of t , with t in seconds.
(Hint: the position function for a projectile is $s(t) = -16t^2 + v_0t + h_0$)
- Calculate the average velocity of the object over the interval $[2,3]$.
- Compute the velocity of the object 1,2 and 3 seconds after it is released.
- How many seconds does it take the object to hit the ground? Round to two decimal places.
- If the object were to hit a six foot tall man right on his bald spot, how fast would the object be moving at the moment of impact? Round your answers to two decimal places.