

3.4 Day 3 Homework Worksheet

1. The circumference of a circle is $C = 2\pi r$, with r the radius in centimeters.

a. Compute the rate of change of a circle's circumference with respect to the radius. Include units.

b. Would the rate of change be larger when the radius is 2 or 5? Why?

2. The surface area of a sphere is $S = 4\pi r^2$.

a. What is the **average rate of change** of the area with respect to the radius when the radius changes from $r = 1$ to $r = 3$?

b. What is the instantaneous rate of change at $r = 3$?

c. Write the equation of the tangent line to $S(r) = 4\pi r^2$ at $r = 1$.

d. Sketch a graph of both $S(r)$ and the tangent line.

e. As the radius increases what happens to the rate of change of $S(r)$?

3. The tangent lines to the graph of $f(x) = x^2$ grow steeper as x increases. At what rate do the slopes of the tangent lines increase?
4. A truck enters the off-ramp of a highway at $t = 0$ seconds. Its position after t seconds is $s(t) = 25t - 0.3t^2$ meters for $0 \leq t \leq 5$.
- How fast is the truck going the moment it enters the off-ramp?
 - Is the truck speeding up or slowing down? Why?
5. The position of a particle moving vertically in a straight line during a 5 second trip is $s(t) = t^2 - t + 10$ cm.
- Find the time t at which the instantaneous velocity is equal to the average velocity for the entire trip.
 - When is the particle moving up? down? Stopped?
 - When is the particle at its maximum height? Why?