

ASSIGNMENT 2

Please check the following when you turn in your assignment:

- Show all work, clearly and in order.
- Circle or otherwise indicate your final answers.
- This assignment has 6 problems and is worth 30 points. It is your responsibility to make sure that you have all of the pages!
- Assignment should have a header with YOUR NAME and STUDENT NUMBER.
- Staple your assignment.

1. (App. C #32, #34) Find all values of x in the interval $[0, 2\pi]$ that satisfy the equation/inequality.

(a) $|\tan x| = 1$ (b) $2 \cos x + 1 > 0$

2. (2.3 #20, #30 / 2.5 #24) Find the limit, if it exists.

(a) $\lim_{h \rightarrow 0} \frac{(3+h)^{-1} - 3^{-1}}{h}$ (b) $\lim_{x \rightarrow 0^+} \sqrt{x} e^{\sin(\pi/x)}$ (c) $\lim_{x \rightarrow \infty} \frac{x+2}{\sqrt{9x^2+1}}$

3. (2.4 #32) The gravitational force exerted by Earth on a unit mass at a distance r from the center of the planet is

$$F(r) = \begin{cases} \frac{GM}{R^3}r, & \text{if } r < R, \\ \frac{GM}{r^2}, & \text{if } r \geq R \end{cases}$$

where M is the mass of Earth, R is its radius, and G is the gravitational constant.
Is F a continuous function of r ?

4. (2.7 #8) If $g(x) = 1 - x^3$, find $g'(0)$ and use it to find an equation of the tangent line to the curve $y = 1 - x^3$ at the point $(0, 1)$.

5. (2.6 #20) The displacement (in meters) of a particle moving in a straight line is given by $s = t^2 - 8t + 18$, where t is measured in seconds.

(a) Find the average velocity over each time interval:

(i) $[3, 4]$ (ii) $[3.5, 4]$ (iii) $[4, 5]$ (iv) $[4, 4.5]$

(b) Find the instantaneous velocity when $t = 4$.

(c) Draw the graph of s as a function of t and draw the secant lines whose slopes are the average velocities in part (a) and the tangent line whose slope is the instantaneous velocity in part (b).

6. (2.9 #20) Sketch the graph of a function that satisfies all of the given conditions:

- $f'(x) > 0$ if $|x| < 2$,
- $f'(x) < 0$ if $|x| > 2$,
- $f'(2) = 0$,
- $\lim_{x \rightarrow \infty} f(x) = 1$,
- $f(-x) = -f(x)$,
- $f''(x) < 0$ if $0 < x < 3$,
- $f''(x) > 0$ if $x > 3$.