

EG02021 Mathematics

Feedback Quiz 2: Differentiation

Total Points 10

Name:

ID:

1. Limits: Algebraically

a) $\lim_{x \rightarrow -4} \frac{x^2 - x - 20}{x + 4}$

b) $\lim_{x \rightarrow \frac{\pi}{6}} (\cos x + \tan x)$

Instantaneous Rates of Change

2. **Volume of a Cancer Tumor.** The spherical volume V of a cancer tumor is given by

$$V = \frac{4}{3} \pi r^3,$$

Where r is the radius of the tumor, in centimeters.

- Find the rate of change of the volume with respect to the radius.
- Find the rate of the change of the volume at $r = 2.5 \text{ cm}$

3. **Population Growth.** The initial population in a bacteria colony is 8000. After t hours, the colony has grown to a number $P(t)$ given by

$$P(t) = 8000 (1 + 0.39t + t^2)$$

- Find the rate of change of the population P with respect to time t . This is also known as the growth rate.
- Find the number of bacteria present after 7 hr. Also, find the growth rate when $t=7$.
- At what time is the growth rate 200,000 bacteria per hour?