

Math 61 DL Unit 5 Hand-in Assignment

Show all the steps in all your calculations. If you simply present answers, you will be given no credit, regardless of whether the answer is correct.

1. (4 points) The volume of fluid in a tank at time t seconds is given by $v(t) = -0.01t^2 + t + 100$ cubic meters. Due to evaporation, its density is also changing, and is given by $d(t) = 9.3t + 8.9$ kg/cubic meter. The total mass is given by the formula

$$\text{Mass} = \text{Density} \times \text{Volume}$$

- What is the total mass at the instant $t = 4$ sec?
- How fast is the total mass changing at the instant $t = 4$ sec?

2. (2 points) OHaganBooks.com stock is selling for \$150 per share and decreasing at a rate of \$30 per year. Its earnings amount to \$1 per share and are increasing at a rate of \$0.6 per year. At what rate is its price-to-earnings (P/E) ratio, the ratio of its stock price to its earnings per share, rising or falling?

3. (4 points) The efficiency¹ of a particular electrical motor depends on its speed according to the formula

$$E(x) = \frac{1350}{x + 16,875x^{-3}}$$

Where x is the speed of the motor in hundreds of rpm.

- Calculate $E'(x)$.
- For which value of x is $E'(x) = 0$?
- Sketch the graph of E and use the graph and the result of part (b) to determine the speed of rotation that gives the greatest efficiency.

Total: 10 points

¹ Motor efficiency is defined as mechanical power delivery (measured in watts) per watt of electrical input.