

Quiz 1 (44371)

MATH 2B, CALCULUS, WINTER 2018

Please write your name and student ID number at the back of the paper. No calculators or phones allowed.

Problem 1.(5 points.) A particle is moving with the given data. Find its position.

$$a(t) = 3 \cos t - 2 \sin t, s(0) = 0, v(0) = 4$$

Notice that $s'(t) = v(t)$ and $v'(t) = a(t)$

We can get $v(t) = 3 \sin t + 2 \cos t + C$. Plug in $v(0) = 4$. we have

$$v(0) = 0 + 2 + C = 4 \Rightarrow C = 2$$

So $v(t) = 3 \sin t + 2 \cos t + 2$. and thus $s(t) = -3 \cos t + 2 \sin t + 2t + D$.

Plug in $s(0) = 0$ we have $s(0) = -3 + 0 + 0 + D = 0 \Rightarrow D = 3$.

$$\therefore s(t) = -3 \cos t + 2 \sin t + 2t + 3$$

Problem 2.(5 points.) Estimate the area under the graph of $f(x) = 1+x^2$ from $x = -1$ to $x = 2$ using six rectangles and midpoints. Sketch the curve and the approximating rectangles.

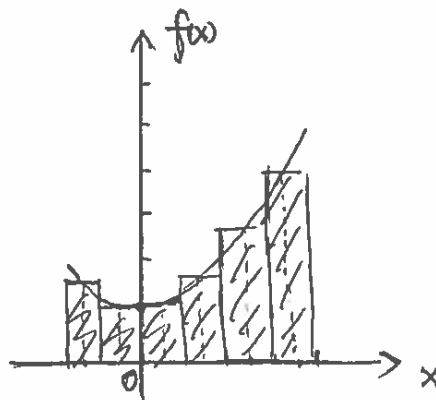
$$\textcircled{1} \Delta x = \frac{2 - (-1)}{6} = \frac{1}{2}$$

$$\text{Midpoints: } x_1 = -\frac{3}{4}, x_2 = -\frac{1}{4}, x_3 = \frac{1}{4}$$

$$x_4 = \frac{3}{4}, x_5 = \frac{5}{4}, x_6 = \frac{7}{4}$$

$$\textcircled{2} f(x_1) = \frac{25}{16}, f(x_2) = \frac{17}{16}, f(x_3) = \frac{17}{16}$$

$$f(x_4) = \frac{25}{16}, f(x_5) = \frac{41}{16}, f(x_6) = \frac{65}{16}$$



$$\textcircled{3} M_6 = \sum_{i=1}^6 f(x_i) \Delta x$$

$$= \frac{1}{2} \times \left(\frac{25}{16} + \frac{17}{16} + \frac{17}{16} + \frac{25}{16} + \frac{41}{16} + \frac{65}{16} \right)$$

$$= \frac{1}{2} \times \frac{1}{16} (25 + 17 + 17 + 25 + 41 + 65)$$

$$= \frac{95}{16} \quad (= 5.9375)$$