MATH 113 – QUIZ 4 – 26 SEPTEMBER 2000

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (3 pts.) Find the points on the curve \( y = x^3 - x \) where the tangent is horizontal.

2. (3 pts.) Find \( dy/dx \) if \( y = 3x^{-2/3} + 2e^x \).

3. (4 pts.) The cost of producing \( x \) units of a commodity is \( C(x) = 5000 - 20x + 0.03x^3 \) dollars. Find \( C'(300) \). What are its units? Explain what this number means.
1. \[ y = x^3 - x \]
   \[ y' = 3x^2 - 1 \]
   \[ 3x^2 - 1 = 0 \]
   \[ 3x^2 = 1 \]
   \[ x^2 = \frac{1}{3} \]
   \[ x = \pm \sqrt{\frac{1}{3}} \]

\[ (\sqrt[3]{\frac{1}{3}})^3 - \sqrt[3]{\frac{1}{3}} = \frac{1}{3\sqrt[3]{3}} \approx -0.384 \]

\[ (\sqrt[3]{\frac{1}{3}})^3 - (-\sqrt[3]{\frac{1}{3}}) = -\frac{1}{3\sqrt[3]{3}} \approx 0.384 \]

\[ (\sqrt[3]{\frac{1}{3}}, -0.384), (-\sqrt[3]{\frac{1}{3}}, 0.384) \]

2. \[ y = 3x^{-2/3} + 2e^x \]
   \[ \frac{dy}{dx} = 3 \left( -\frac{2}{3} x^{-5/3} \right) + 2e^x \]
   \[ = -2x^{-5/3} + 2e^x \]

3. \[ C(x) = 5000 - 20x + 0.03x^3 \]
   \[ C'(x) = -20 + 0.09x^2 \]
   \[ C'(300) = 8080 \text{ dollars/unit} \]

The 301st unit will cost about 8080 dollars.