

MATH 108 – 28 MARCH 2011– EXAM 2

Answer each of the following questions. Show all work, as partial credit may be given.

1. Let $f(x) = 3x + \frac{2}{x+1}$.

(a) (10 pts.) *Use increments to estimate* how much $f(x)$ will change if x increases from 2 to 2.2.

(b) (5 pts.) Find the *exact change* in $f(x)$ if x increases from 2 to 2.2.

2. (10 pts.) An environmental study of a certain community suggests that t years from now the average level of carbon monoxide in the air will be $Q(t) = 0.002t^3 + 0.1t + 3.4$ parts per million. By approximately how much will the carbon monoxide level change during the 10th year from now?

3. (10 pts.) Find the equation of the tangent line to the curve given by the equation $x^2y^3 - 2y = 6x - 5$ that passes through the point $(1, -1)$.

4. (10 pts.) Let $f(t) = \frac{3t^2}{t^2 - t - 2}$.

(a) Find all vertical and horizontal asymptotes of $f(t)$.

(b) Given that $f'(t) = \frac{-3t(t+4)}{(t^2 - t - 2)^2}$, find the intervals on which $f(t)$ is increasing and decreasing.

(c) Using the information you found in parts (a), and (b), sketch the graph of $f(t)$. The sketch should accurately reflect the basic shape of the graph.

5. (10 pts. each) Let $f(x) = x^4 + 4x^3 + 4x^2$.

(a) Find all critical numbers for $f(x)$ and find its intervals of increase and decrease.

(b) Find all critical *points* of $f(x)$ and identify them as relative maxima, relative minima or neither.

(c) Find the intervals on which the graph of $f(x)$ is concave up and concave down. Find all inflection *points* of $f(x)$.

(d) Sketch the graph of $f(x)$, labeling all critical points and inflection points with their coordinates. The sketch should accurately reflect the basic shape of the graph.