

STUDENT NAME:

Calculus 1550, section 20. Wednesday, November 11, 2003. Twenty-third quiz.

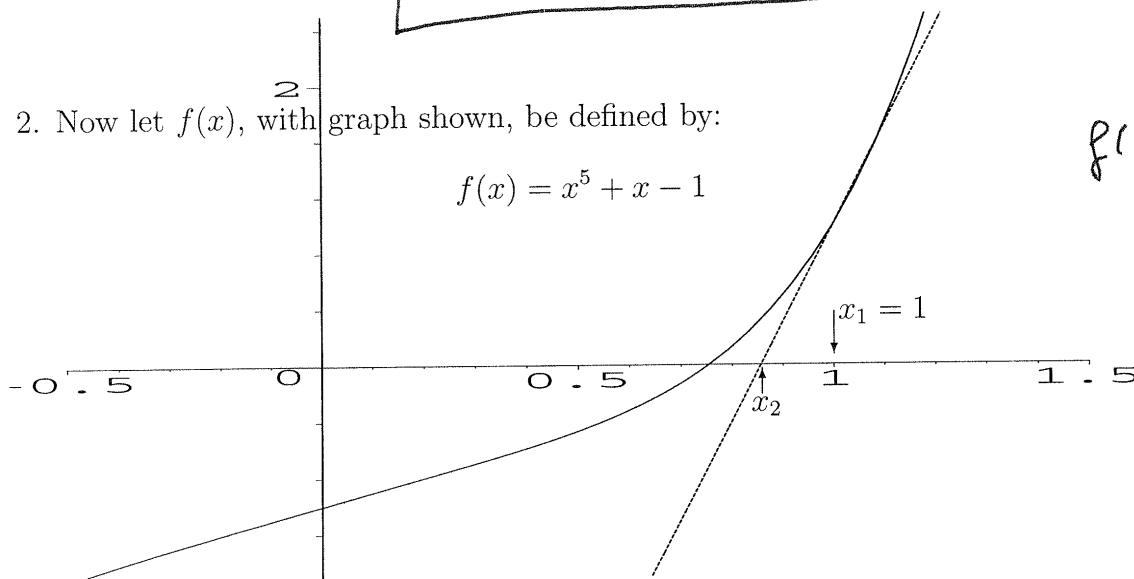
1. In Newton's method, if x_n is an approximation to a solution to an equation $f(x) = 0$, what is the formula for the next approximation, x_{n+1} ? [2 points]

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

2. Now let $f(x)$, with graph shown, be defined by:

$$f(x) = x^5 + x - 1$$

$$f'(x) = 5x^4 + 1$$



- 2.a. What is the equation of the tangent line at $x = 1$, sketched in the figure? [3 points]

$f(1) = 1$, so point at $(1, 1)$; slope = $f'(1) = 5 \cdot 1^4 + 1 = 6$
eqⁿ of tangent is $\frac{y-1}{x-1} = 6 \Rightarrow y-1 = 6x-6$
 $\Rightarrow \boxed{y = 6x - 5}$

- 2.b. Find x_2 and x_3 . [4 points]
- $$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 1 - \frac{1}{6} = \frac{5}{6} \approx 0.833$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = \frac{5}{6} - \frac{((\frac{5}{6})^5 + (\frac{5}{6}) - 1)}{(5(\frac{5}{6})^4 + 1)} \approx 0.83 - \frac{0.235}{3.411} \approx 0.764$$

$$\boxed{x_3 \approx 0.764}$$

- 2.c. What is $f(x_3)$? [1 point]

$$f(x_3) \approx 0.764^5 + 0.764 - 1 \approx 0.0253$$