Info

- There is no Homework due next Monday.
- There are EMCFs due every MWF.
- There is an Online Quiz due Monday.
- Take care of Practice Test 2!
- Schedule and take Test 2!

P12

1. Use Newton’s method with a guess of 2 to approximate a solution to 
\[ x^3 - \sin(x) - 8x = 0. \]

2. Use differentials to approximate \( \sin(61^\circ) \). Hint: Convert \( 61^\circ \) to radians, and note that this value is close to \( \pi / 3 \).

The Mean Value Theorem

Section 4.1

Question: How many values are there between -1 and 3
where the tangent line is parallel to the secant line connecting \(( -1, f(-1)) \) and \((3, f(3))\)?
**Question:** How many values are there between 0 and 6 where the tangent line is parallel to the secant line connecting \((0, f(0))\) and \((6, f(6))\)?

**General Question:** Are there values between \(a\) and \(b\) where the tangent line is parallel to the secant line connecting \((a, f(a))\) and \((b, f(b))\)?

**P12**

3. How many values are there between 0 and 6 where the tangent line is parallel to the secant line connecting \((0, f(0))\) and \((6, f(6))\)?

**Mean Value Theorem:** If \(f\) is continuous on \([a, b]\) and differentiable on \((a, b)\), then there is at least one value \(c\) between \(a\) and \(b\) so that

\[
f(b) - f(a) = f'(c)(b - a)\]

**Special Case of MVT:** Assume \(f'(a) = f'(b) = 0\). Then there is at least one value \(c\) between \(a\) and \(b\) so that \(f'(c) = 0\).
Example: **Verify the mean value theorem for** \( f(x) = 3x - x^2 \) **on the interval** \([-1, 3]\).

\[
\text{We need to find }\quad -1 < c < 3 \quad \text{so that} \quad f'(c) = \frac{f(3) - f(-1)}{3 - (-1)}
\]

\[
f'(c) = 3 - 2c = \frac{0 - 4}{4}
\]

\[
3 - 2c = 1 
\]

\[
c = 1 
\]

Note: \(-1 < c < 3\).

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**P12**

4. There is exactly one value that satisfies the conclusion of the mean value theorem for the function \( f(x) = x^3 + x - 1 \) on the interval \([0, 2]\). Give this value.