Name: _____ **Precalculus Unit 4, Lesson 8**

Aim: What is the Intermediate Value Theorem?

I. Do Now:

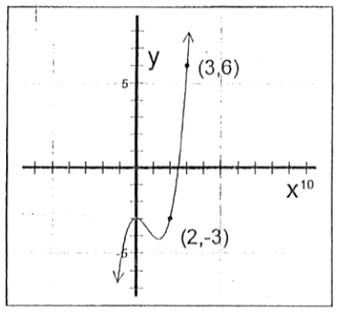
1. Write a polynomial function with the following zeros: $3, 3, -\frac{1}{2}$

2. Given $f(x) = 3x - 6x^4 + 2$
   (a) Describe the end behavior of the graph.
   (b) What is the maximum number of turning points?
   (c) What is the maximum number of real roots?
   (d) Using your calculator, find the following values:
   $f(-1) =$ ___ $f(0) =$ ___ $f(1) =$ ___ $f(2) =$ ___

II. The Intermediate Value Theorem (IVT):
Let *a* and *b* be real numbers such that $a < b$. If $f(x)$ is a polynomial function such that $f(a) \neq f(b)$, then, in the interval $[a, b]$, $f(x)$ takes on every *y*-value between $f(a)$ and $f(b)$.

Why is this theorem useful? _____

Example: The graph of $f(x)$ is shown below.



$f(2) =$ ____ $f(3) =$ ____

What happens to the graph between these two *x*-values?

_____

What can you conclude?

III. Applications

3. Given $f(x) = x^3 - x - 1$. Use the IVT to show that there is at least one root on $[1, 2]$.

4. Given $g(x) = x^3 - 5x^2 + 8x - 9$. Show that there exists at least one *c* such that $g(c) = 27$.

5. On what interval *must* the function $g(x) = 2x^2 + 7x - 1$ intersect the line $y = 7$?
   (A) $[-8, -6]$ (D) $[6, 9]$
   (B) $[-4, -1]$ (E) $[2, 4]$
   (C) $[0, 2]$

6. Suppose that *f* is a polynomial function $f(-5) = 3$ and $f(-1) = -2$. If $f(x) = 0$ for one and only one value of *x*, then which of the following could be *x*?
   (A) –7 (B) –2 (C) 0 (D) 1 (E) 2

7. State whether each statement given below is
   • False
   • True, but not due to the IVT
   • True due to the IVT

   (a) If $g(x)$ is a function with $g(0) = 4$ and $g(3) = 7$, then there is some *x* between 0 and 3 such that $g(x) = 5$.
   (b) Let $f(x) = x^3 + 2x^2 - 5$. There is some value of *x* between 1 and 2 where $f(x) = 4$.
   (c) If $f(t)$ is a polynomial function, $f(-5) = 6$, and $f(3) = -9$, then $f(0)$ could be equal to 10.

8. If $f(x) = x^3 - x + 3$ and if *c* is the only real number such that $f(c) = 0$, then *c* is between
   (A) –2 and –1 (D) 1 and 2
   (B) –1 and 0 (E) 2 and 3
   (C) 0 and 1

HW31
- Read page 108.
- Complete this sheet.
- p. 110: 30, 33, 56, 57, 69, 71, 95, 97, 104