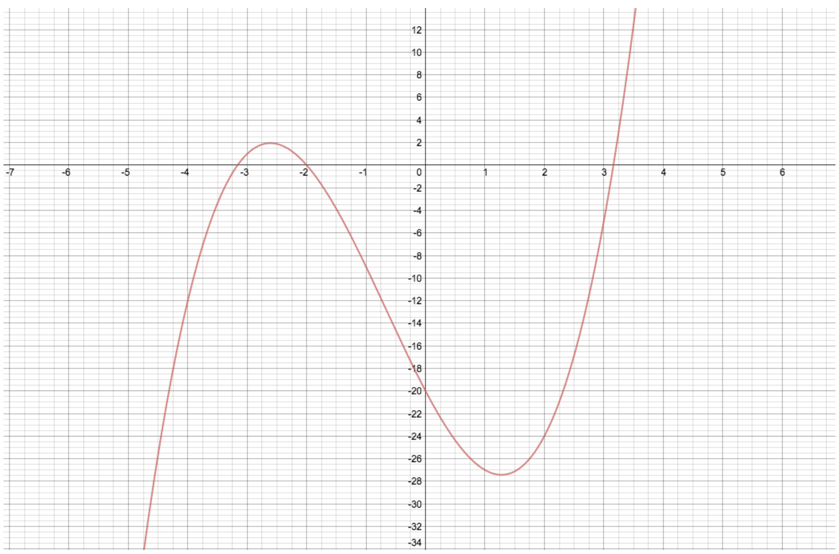
Mathematics 1375/OL79, Fall 2020 **Quiz #3 (take-home)**
Instructor: Suman Ganguli **Due Sunday, Nov 8** **Name:** ______________________

Question:	1	2	3	4	5	Total
Points:	2	6	4	4	4	20
Score:						

> In order to receive full credit, you must **show all your work** and simplify your answers. Submit your written solutions by the end of the day Sunday on Blackboard (look for the "Quiz #3" Assignment). Please scan your written answers to a single pdf file.

Shown below is the graph of the cubic polynomial $p(x) = x^3 + 2x^2 - 10x - 20$:



1. (2 points) From the graph, it *seems* that $x = -2$ is a root of $p(x)$. Verify that this is the case (i.e., show that $p(-2) = 0$).

2. (6 points) Use the root $c = -2$ to factor the polynomial $p(x)$:

   (a) Since we know from #1 that $c = -2$ is a root of p, we know $(x - c) = (x + 2)$ is a factor of $p(x)$. Use long division to compute $\dfrac{p(x)}{x+2}$:

   $$x + 2 \overline{\smash{)}\, x^3 \quad + \quad 2x^2 \quad - \quad 10x \quad - \quad 20}$$

   (b) Fill in the blank with your result from (a) to get the factorization of $p(x)$:

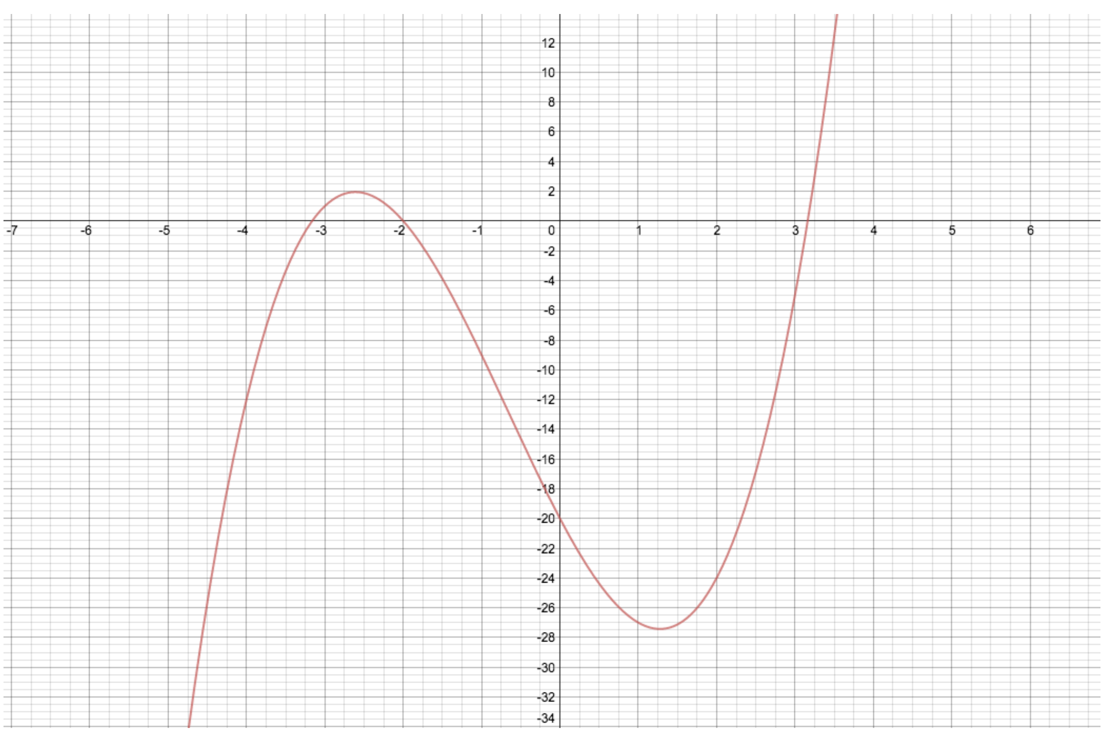
   $$p(x) = x^3 + 2x^2 - 10x - 20 = (x + 2)(\underline{\hspace{6cm}})$$

3. (4 points) Use the factorization from #2(b) to *algebraically* solve for the other two roots of $p(x)$ in radical form (i.e., solve for the roots of the quadratic polynomial that results from factoring $x + 2$ out of $p(x)$). Leave your answers in radical form, i.e., in terms of square roots.

4. (4 points) (a) Write down the (x, y) coordinates of the 3 x-intercepts of the graph of $p(x)$, corresponding to the 3 roots:

   (b) Algebraically calculate the y-intercept of the graph $y = p(x)$ and write down the coordinates of the y-intercept:

5. (4 points) Label the x-intercepts and the y-intercept on the graph with their (x, y) coordinates (leave the x-coordinates corresponding to the 2 roots you found in #3 in radical form, i.e., in terms of square roots).



Extra credit (up to 3pts): Recreate the graph of $p(x)$ in Desmos, and then click on x-intercepts, the y-intercept, and also the local maximum and the local minimum (so that Desmos displays the coordinates of these 6 points).

Download or screenshot your graph to an image file, and submit with your quiz solutions on Blackboard.