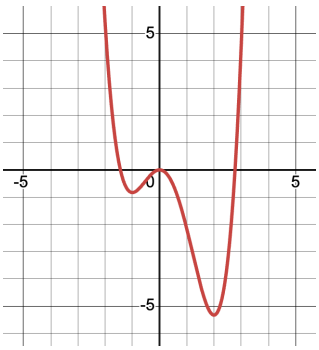
Math 117 Exam 2 Review Problems

These problems are intended to help you prepare for the test. Test problems will look similar to, but not the same as, some of the problems below.

This list of problems is not all inclusive and does not represent every possible type of problem. It is suggested that you review lectures, classwork problems, and homework problems in addition to this review.

Due on the day of the exam.

(1) Consider the following graph of a polynomial:



(a) For what x-value(s) does the graph have a relative minimum? For what x-value(s) does the graph have a relative maximum?

(b) Estimate the y-value(s) of any absolute extrema or state that there is none.

(c) Describe the end behavior of the graph

(d) Is the degree of this polynomial odd or even? Is the leading coefficient positive or negative?

(2) Completely factor the following polynomials

(a) $2x^3 + 4x^2 - 2x - 4$

(b) $3x^3 + 8x^2 + 3x - 2$

(c) $x^3 - x^2 + 4x - 4$ given $x = 1$ is a root

(d) $2x^4 + 3x^3 + 4x^2 + 9x - 6$ given $x = i\sqrt{3}$ is a root

(3) Solve the following polynomial equations/inequalities

(a) $x^2 - 3x - 10 < 0$

(b) $3x^2 + 9x \geq 0$

(c) $x^3 + 3x^2 - 4x - 12 = 0$

(d) $2x^2 - 2x + 3 = 0$

(4) Perform the operation and simplify your answer:

(a) Simplify $(5+i)+(2-3i)-(4-7i)$

(b) Multiply $(3-4i)(4+5i)$

(c) Divide $\frac{3+2i}{1-i}$

(d) Multiply $\sqrt{-2}\cdot\sqrt{-18}$

(5) Consider the following piecewise function:

$$f(x)=\begin{cases}8+2x & \text{if } -3\le x\le -1\\ 5-x & \text{if } -1< x\le 2\\ x+1 & \text{if } 2< x\le 5\end{cases}$$

(a) Find $f(-2)$, $f(-1)$, $f(2)$, and $f(3)$

(b) Sketch a graph of f

(6) Find the vertex of the following quadratic functions:

(a) $2x^2+4x-5$

(b) x^2+8x-5

(7) Perform each operation and write your answer in standard form $(a+bi)$

(a) $(2-3i)+(-3+3i)$

(b) $(-5+3i)-(-3-5i)$

(c) $(3+2i)(-4-i)$

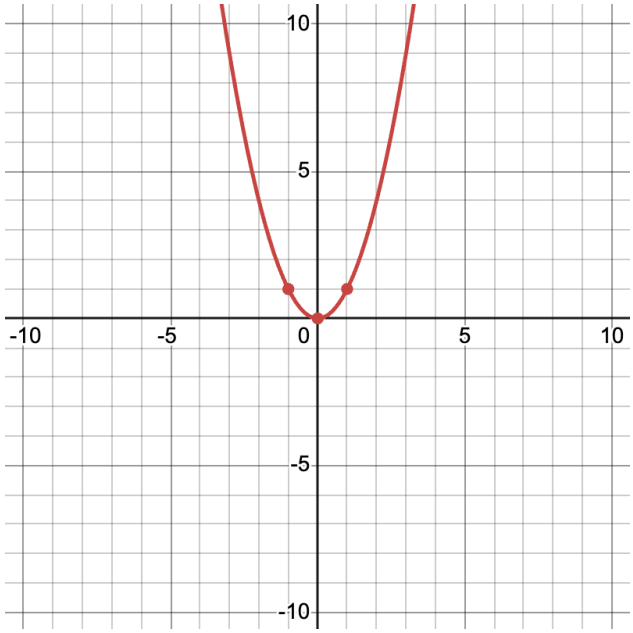
(d) $\frac{3+2i}{2-i}$

(8) Using transformations of graphs, graph the function $f(x)=-4\sqrt{-x}$ from $y=\sqrt{x}$

(9) Consider the function $f(x)=-2(x-4)^2+1$

(a) Explain the steps (in proper order) for how you should graph $f(x)$ based off of the graph of $y=x^2$

(b) Graph the function by applying the above steps to the following graph of x^2. **You must keep track of the three indicated points when doing your transformations.**



(10) Using transformations of graphs, graph the function $f(x)=-2(x-2)^2+3$ from $y=x^2$.

(11) Factor the following polynomials completely.

(a) $x^2 - 10x + 16$

(b) $3x^2 - 9x - 30$

(c) $2x^2 - 5x - 3$

(d) $x^3 - 3x^2 + 2x - 6$

(12) Factor the following polynomials into linear factors:

(a) $x^2 + 12x + 35$

(b) $x^4 + x^3 + 2x^2 + x + 1$. Using that i is a root.

(c) $3x^3 - x^2 - 2x$

(d) $x^4 + 3x^3 + x^2 - 3x - 2$. Using that -1 is a root.

(13) Consider $f(x) = 3x^4 - 5x^3 - 4x^2 - 8x + 5$ and $g(x) = x - 3$

(a) Use *long division* to divide $f(x)$ by $g(x)$.

(b) Now, use *synthetic division* to divide $f(x)$ by $g(x)$.

Your answers should be in the form $\dfrac{f(x)}{g(x)} = q(x) + \dfrac{r(x)}{g(x)}$.

(14) Divide the expression:

(a) $\frac{14x^3-21x^2-7x}{7x}$

(b) $\frac{2x^3-x^2-4x+1}{x+2}$

(c) $\frac{3x^3-5x^2+13x-18}{x^2+4}$

(15) Determine if the function is odd, even, or neither.

(a) $f(x) = x^8 + x^4$

(b) $f(x) = 2x\sqrt{1 - x^2}$

(c) $f(x) = -5x^3 - 18$

(d) $f(x) = 7x^5 + 3x^3 - x$

(16) Consider $f(x) = x^3(4 - x)^3(x + 5)$

(a) Describe the end behavior of the graph.

(b) Find the x-intercepts. State the multiplicity of each intercept and whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.

(c) Find the y-intercept

(d) Determine whether the graph has y-axis symmetry (even function), origin symmetry (odd function), or neither.

(e) Graph