Midterm 1 review guide. Math 30 (Precalculus).

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This is a list of topics that you should know well from each section, and which exercises from the book you can do practice that topic.

NOTE: The list of exercises is very long. It does not mean that you have to do all these exercises. Rather, for each topic in each section, try a couple of exercises. If everything is very clear, move on to the next topic; otherwise try a few more exercises and ask for help if you need.

- **Section 1.1**
  - Evaluate functions given their expression. *Ex. 27, 30–33, 35*
  - When a graph is the graph of a function: vertical line test. *Ex. 40–43*
  - Evaluate functions given their graph. *Ex. 53, 54, 56, 58, 59*
  - Evaluate functions given table of values. *Ex. 66, 67*
- **Section 1.2**
  - Understand the concept of domain and range.
  - Finding domain of a function given its expression. *Ex. 6, 8, 10, 14, 15, 18, 25*
  - Finding domain and range of a function given its graph. *Ex. 33–37*
  - Graphing and evaluating piecewise-defined functions. *Ex. 38, 39, 46–48, 51*
- **Section 2.1**
  - Understand concept of linear function.
  - Find slope of line through two points. *Ex. 25–29.*
  - Find equation of line through two points. *Ex. 30–35*
  - Find slope given graph. *Ex. 39–45*
  - Determine if a function is linear given a table of values. *Ex. 47, 47*
- **Section 2.2**
  - Find x and y intercepts of an equation. *Ex. 12–15*
  - Find slopes of lines and determine if they are parallel, perpendicular or neither. *Ex. 18–20*
  - Find equations of parallel and perpendicular lines. *Ex. 24–27*
  - Find slope given graph. *32–37*
  - Sketch the graph of a linear equation. *44–50.*
- **Section 3.2**
  - Understanding quadratic functions: $f(x) = ax^2 + bx + c$.
  - Understanding that the graph of a quadratic function is a parabola.
  - Standard form of a quadratic function. Completing the square. *Ex. 1, 7, 9, 11, 13, 45, 47.*
  - Find vertex, axis of symmetry, y-intercepts and x-intercepts of a quadratic function.
  - Graph quadratic functions. *Ex. 53 to 64 odd numbered, 65.*
  - Find maximum/minimum of a quadratic function *Ex. 15, 17.*

- **Section 3.3**
  - Identifying power functions and polynomial functions. *Ex. 7, 9, 11.*
  - Understand the concept of end behavior of a function. Remember that for polynomials there are four types of end behavior: $\nwarrow\ \nearrow$, $\nwarrow\ \searrow$, $\swarrow\ \nearrow$, and $\swarrow\ \searrow$
  - Find the degree, leading term, leading coefficient, and constant term of a polynomial. *Ex. 1, 2, 12, 13, 15.*
  - Find the end behavior of polynomial functions. *Ex. 17 to 23.*
  - Turning points of polynomial functions: at most, the number of turning points is one less than the degree. *Ex. 4, 31, 33, 35.*
  - Finding y-intercepts of polynomial functions: it is just $f(0)$.
  - Finding x-intercepts of polynomial functions: solve $f(x) = 0$. *Ex. 25, 26, 27, 29.*
  - At most, the number of x-intercepts is the same as the degree.
- **Section 3.4**
  - Knowing that the x-intercepts of a function are also called "zeros" and "roots". They are the solutions of $f(x) = 0$ (note: in the book, x-intercept means a point where the function touches the x-axis, and zero means the x coordinate of that point; we use the terms as synonyms).
  - Solve $f(x) = 0$ by factoring. *Ex. 7 to 23, odd numbered.*
  - Multiplicities of zeros of a polynomial. *Ex. 31 to 41, odd numbered.*
  - Undestand the local behavior at the zeros of a polynomial using the multiplicities.
  - Use the end behavior and the local behavior at the x-intercepts to graph polynomial functions. *Ex. 42 to 47.*
  - Finding a formula of a polynomial function given its graph. *Ex. 41 to 55, odd numbered.*
  - Finding a formula of a polynomial function given some information. *Ex. 57 to 63, odd numbered.*
- **Section 3.5**
  - Long division of polynomials. *Ex. 3, 5, 7, 9, 11.*
  - Dividend, divisor, remainder and quotient of division of polynomials. Division algorithm: $D = d \cdot q + r$.
  - Synthetic division of polynomials. *Ex. 15 to 27, odd numbered, 49, 51, 53.*
- **Section 3.6**
  - Understand the Remainder Theorem: the value $f(a)$ is the same as the remainder we get when we divide $f(x)$ by $(x - a)$. *Ex. 7, 9, 11.*
  - Evaluate polynomials using the remainder theorem.
  - Understand the Factor Theorem: the value a is a zero of $f(x)$ means that $(x - a)$ is a factor of $f(x)$.
  - Finding all the zeros of a polyomial given a factor. *Ex. 15, 17, 19.*
  - The Rational Zero Theorem: if a is a zero of $f(x)$, then it must have the form p/q, where p divides the constant coefficient and q divides the leading coefficient.
  - Use the Rational Zero Theorem to find all the possible rational zeros of a polynomial. *Ex. 2, 23 to 39 odd numbered, 41, 43.*
  - Finding all the zeros of (or factoring) polynomial functions. *Ex.5, 23 to 39 odd numbered, 67, 69.*
  - Fundamental Theorem of Algebra: the number of zeros of a polynomial is exactly the same as its degree (note: some zeros may be complex numbers).
  - Complex conjugate theorem: If $a + bi$ is a zero of a polynomial, then its conjugate $a - bi$ is also a zero.