Math 150 - Week-In-Review 2
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Exam 1 review - Chapters 1 and 2

1. Perform the indicated operation on the functions $f(x) = \dfrac{x}{x-2}$ and $g(x) = \sqrt{3x-1}$.

   a. $(fg)(z)$

   b. $\left(\dfrac{f}{g}\right)\left(\tfrac{1}{3}\right)$

   c. $(f \circ g)(x)$

d. $(g \circ f)(x)$

2. Let $f(x) = x^3$. Determine the formula of the function $g(x)$ whose graph is the result of the graph of $f(x)$ undergoing the following sequence of transformations.

   (a) Horizontal shrink by a factor of 3.

   (b) Horizontal shift 5 units right.

   (c) Vertical shift down 2 units.

   (d) reflect about the y-axis.

   (e) Vertical shrink by factor of 2.

3. Write the function $h(x) = \dfrac{1}{3}x^2 - 4x + 3$ in vertex form. Then determine the vertex, whether the vertex is a maximum or minimum, and the axis of symmetry.

4. Find the quadratic with axis of symmetry $x = 3$, a zero at $(4,0)$, and a y-intercept of $(0,16)$.

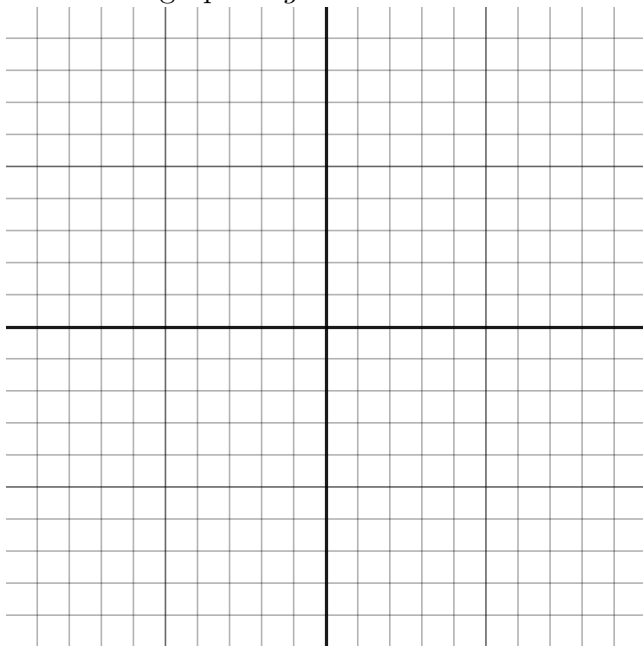5. Consider the function $g(x) = -\frac{5}{2} + 3(2 - x)^2$.

    a) Identify the parent function f.

    b) Describe the sequence of transformations from f to g.

    c) Use function notation to write g in terms of f.

    d) Evaluate intercepts, vertex and axis of symmetry of $g(x)$.

    e) Sketch the graph of g.

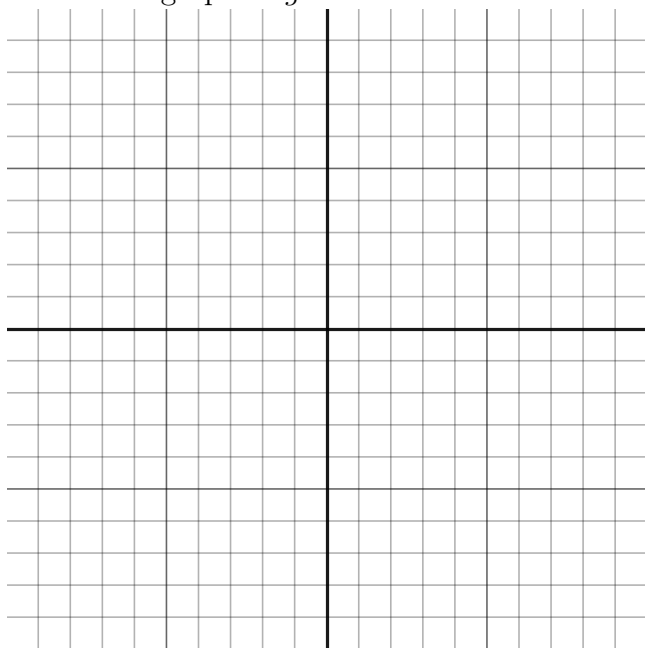6. Consider the function $g(x) = -3\,|x + 7| - 4$.

    a) Identify the parent function f.

    b) Describe the sequence of transformations from f to g.

    c) Use function notation to write g in terms of f.

    d) Evaluate intercepts, vertex and axis of symmetry of $g(x)$.

    e) Sketch the graph of g.

7. Most cars get their best gas mileage when traveling at a relatively modest speed. The gas mileage M for a certain new car is modeled by the function $M(s) = \dfrac{-1}{28}s^2 + 3s - 31$ where s is the speed in mi/h and M is measured in mi/gal. What is the car's best gas mileage and at what speed is it attained?

8. The two towers of a suspension bridge are 500 feet apart. The parabolic cable attached to the tops of the towers is 10 feet above the point on the bridge deck that is midway between the towers. If the towers are 100 feet tall, find the height of the cable directly above a point of the bridge deck that is 50 feet to the right of the left-hand tower.

9. Solve the equation by using the quadratic formula $2x^2 = 3 - 2x$.

10. Solve the equation $5x^2 + 2x - 1 = 0$ by completing the square.

11. For the given polynomial functions, determine the leading term, leading coefficient, degree, constant end behavior of the graph.

a) $g(x) = -2x^7 + 5x^3 + 4x - 16$

b) $g(x) = -4x^6 - 3x^5 + 8$

12. Find the zeros and their multiplicities for the following functions, then determine the end behavior and maximum number of turning points. Roughly sketch the graph.

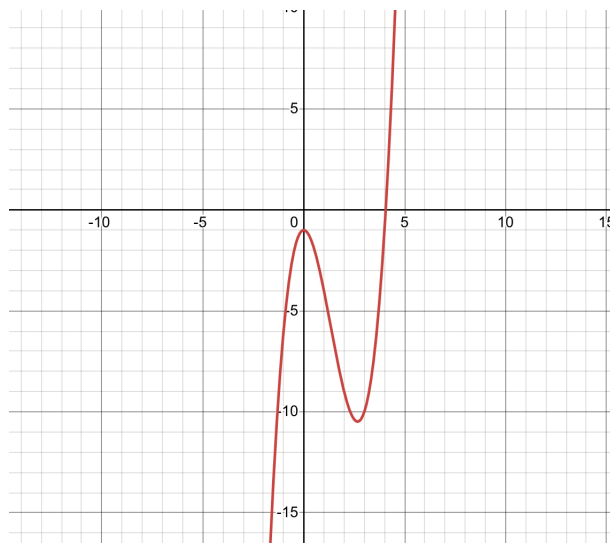a) $k(x) = x^4(x - 2)^3(x + 1)^2$

b) $f(x) = (2 - x)(-x + 3)x^2$

13. Determine the quotient with fractional remainder (if necessary) of the function
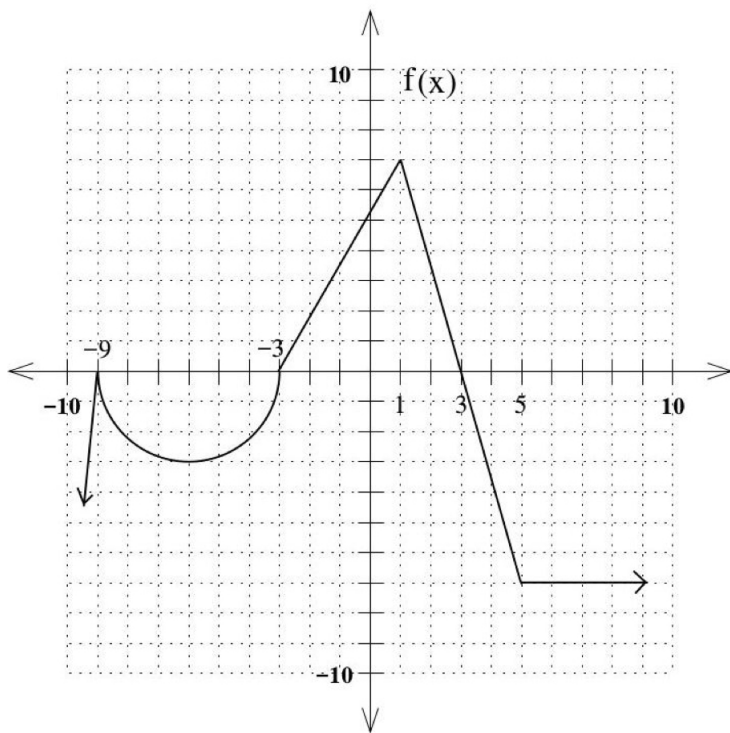$(7x^5 - 46x^3 - 14x + 3) \div (x + 3)$.

14. Find a polynomial of degree four that has zeros -3, 0, 1 and the coefficient of x^3 is -6.

15. Graph of the function $f(x) = x^3 - 4x^2 - 25$ is given. Solve for $x^3 - 4x^2 \geq 25$.

16. In the following graph, state domain, range, interval of increase, interval of decrease and absolute extrema.

17. Test the equation $y = x^3 - 9|x|$ for symmetry.

18. Plot the points $P = (-1, -4)$, $Q = (1, 1)$, and $R = (4, 2)$ on a coordinate plane. Where should the point S be located so that the figure PQRS is a parallelogram?

19. Find average rate of change of the function $r(t) = 3 - \frac{1}{3}t$ from $t = 1$ to $t = 5$.

20. Solve the inequality $|3x + 2| \geq 4x^2 + 1$.

21. Consider the complex numbers $z_1 = 1 + \sqrt{-27}$ and $z_2 = 2 - \sqrt{-12}$.

    (a) Write z_1 and z_2 in standard form.

    (b) Find $z_1 + z_2$, $z_1 - z_2$, and $z_1 z_2$.

    (c) Find the complex conjugate of z_1.

    (d) Find $z_2 \div z_1$.