

NAME:

SHOW ALL WORK to receive full credit. You are not allowed to collaborate with anyone but you will be able to access your notes, book, and graphing calculator (online or handheld).

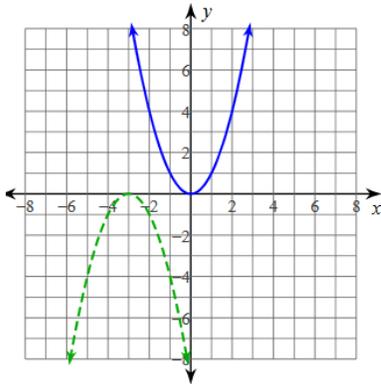
1. (4 points) State the domain of the function $m(r) = \frac{1}{\sqrt{r^2 - 1}}$.

2. (8 points) A company produces baseball caps. The cost of the building and overhead is fixed at \$10,000, and the cost of producing each cap is \$2. If the company sells baseball caps at \$18 each, what is the break-even production volume for baseball caps?

3. (6 points) The following table gives data for a linear function. Find a formula for the function.

x	200	230	300	320	400
$g(x)$	70	68.5	65	64	60

4. (6 points) The graph below contains transformations of the graph of $f(x)$ (solid line) into that of $g(x)$ (dashed line).



(a) Describe the transformations in words.

(b) Write a formula for $g(x)$ in terms of $f(x)$.

5. (5 points) Let $f(x) = 3x - 7$ and $g(x) = x^2 + 1$. Find a formula for each function composition. Simplify your answers.

(a) $f(f(x))$

(b) $g(f(x))$

6. (4 points) The volume of a sphere of radius r is given by $V = f(r) = \frac{4}{3}\pi r^3$.

(a) Find the inverse function $f^{-1}(V)$

(b) What does $f^{-1}(V)$ represent?

7. (4 points) An orange is thrown vertically into the air at time $t = 0$. Its height, $h(t)$ (in feet), above the ground at time t (in seconds) is given by $h(t) = -16t^2 + 48t$. Find the time it takes for the orange to hit the ground.

8. (5 points) Find a formula for the quadratic function $f(x)$ with a y -intercept of $(0, 6)$ and x -intercepts of $(-1, 0)$ and $(2, 0)$.

9. (7 points) Let $y = 5x^2 - 5x + 7$.

(a) Identify the y -intercept of this function.

(b) Complete the square and write the equation in vertex form.

(c) Identify the vertex of this function.

(d) What is the axis of symmetry of this parabola?

(e) Is the graph of this function concave up or concave down?

10. (7 points) Let $p(x) = x^2 - 3x + 1$.

(a) Give a formula in terms of x for the transformation $q(x) = p(-2x) - 3$.

(b) Describe in words how the graph of $y = p(x)$ is transformed to obtain the graph of $y = q(x)$.

11. (6 points) Suppose y is inversely proportional to x and $y = 16$ when $x = 6$. Find the constant of proportionality, write a formula for y in terms of x , and find x when $y = 8$.

12. (6 points) Consider the polynomial function $y = (x^2 - 4)(x^2 - 2x - 3)$.

(a) Find the leading term.

(b) Find the degree

(c) Find all zeros.

13. (6 points) The population of Mathville has been increasing since 2010 when it was 12,000. If the population t years after 2010 is $P(t) = 20 \left(\frac{4t + 3}{2t + 5} \right)$ thousand, when will the population of Mathville reach 20,000?

14. (5 points) The point $(-3, 4)$ is on the graph of $y = g(x)$. Give the coordinates of one point on the graph of the function $y = g(-3x)$.

15. (5 points) Describe in words the long-run behavior as $x \rightarrow \infty$ of each function.

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

(b) $y = x^{-4}$

16. (3 points) Find $\lim_{x \rightarrow -\infty} \frac{2 + 5x}{6x + 3}$.

17. (9 points) Let $f(x) = \frac{(x+2)(x-6)(x+1)}{(x-2)(2x+5)(x+1)}$.

(a) Find the x coordinates of the holes (if any) in the graph of $y = f(x)$.

(b) Find the equation for each vertical asymptote, if any.

(c) Find the equation for each horizontal asymptote, if any.

(d) Find the x -intercepts, if any.

(e) Find the y -intercept, if any.

18. (4 points) Sketch the graph of a function with zeros at $x = -3$ and $x = 2$, vertical asymptotes at $x = -5$ and $x = 7$, and horizontal asymptote of $y = 1$.