

Show all work and justify all answers or credit might not be awarded.

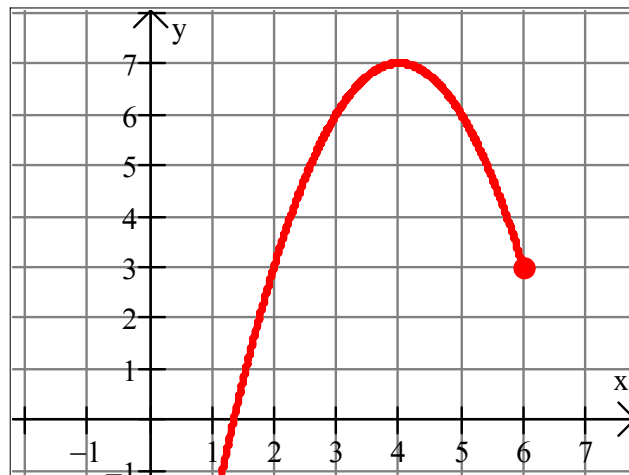
1. Find the (implied) domain of the function given by $F(x) = \sqrt{17x - 3}$.

Answer: _____

2. Find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$ given that $f(x) = 5 + 3x - x^2$.

Answer: _____

The graph of a function g appears in the following figure. Use it to respond to problems 3 and 4.



3. What is the range of g ? Answer 3: _____

4. Find all intervals on which g is increasing. Answer 4: _____

5. Find a formula for the function that is finally graphed after all three of the following transformations are applied to the graph of $y = \ln(x)$.
- (1) Shift down 4 units
 - (2) Shift right 2 units
 - (3) Reflect about the x -axis

Answer: _____

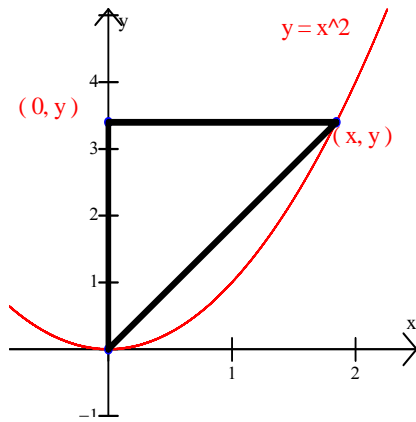
6. Find the average rate of change of $h(x) = x^2$ from -1 to 3 .

Answer: _____

7. Determine algebraically whether the function $G(t) = 3 - 2|t|$ is even, odd, or neither.

Answer: _____

8. A right triangle has one vertex at the origin, another at a point (x, y) on the graph of $y = x^2$, $x > 0$, and a third at the point on the positive y -axis at $(0, y)$. Express the area of the triangle as a function of x .



Answer: _____

9. Find all the real zeros of the polynomial function $P(x) = 2x^3 - 3x^2 - 23x + 42$ given that $x = 2$ is a zero of P .

Answer: $P(x) =$ _____.

10. For the polynomial function $p(x) = (x + 3)^2(7x - 1)^3(x - 10)$, find each x -intercept and determine whether the graph crosses or touches the x -axis at each x -intercept.

Answer: _____

11. Find all vertical, horizontal, and oblique asymptotes of the rational function

$$R(x) = \frac{2x^2 - x + 2}{x - 1}.$$

Vertical asymptote(s): _____

Horizontal asymptote(s): _____

Oblique asymptote(s): _____

12. Find the (implied) domain of $r(x) = \sqrt{\frac{7x+3}{5-x}}$ by solving the inequality $\frac{7x+3}{5-x} \geq 0$.

Answer: _____.

13. Consider the polynomial $p(x) = 18x^5 + 69x^4 - 1402x^3 + 216x^2 + 312x - 77$. State the maximum number of zeros that this polynomial can have. Then use Descartes' Rule of Signs to determine how many positive and how many negative zeros the function may have. Do **not** attempt to find the zeros.

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Maximum number of zeros: _____

Possible number(s) of positive zeros: _____

Possible number(s) of negative zeros: _____

14. Solve the following equation in the real number system: $x^4 - x^2 - 12 = 0$.

Answer(s): _____.

15. Let $f(x) = x^2 - x$ and $g(x) = 5x + 1$. Compute and simplify $f(g(x))$ and $g(f(x))$ by writing each as a quadratic function in standard form.

$f(g(x)) =$ _____

$g(f(x)) =$ _____

16. Find a formula for the function that is the inverse of $f(x) = \frac{3x-2}{x+5}$, $x \neq -5$.

Answer: $f^{-1}(x) =$ _____.

17. Determine the domain, range, and horizontal asymptote of the function $f(x) = 3^{-x} + 5$.

Domain: _____

Range: _____

Horiz. asymptote: _____

18. Find all real solutions of the equation $\log_2(3x + 5) = 4$.

Answer: _____

19. Write the following expression as a single logarithm: $\log_5(x - 2) + 2\log_5(3x + 1)$.

Answer: \log_5

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20. **Radioactive Decay.** The half-life of radium is 1590 years. If 20 grams are present now, how much will be present in 100 years? (Round your answer to four decimal places).

Answer: _____ grams