

Multiple Choice

1. What is the domain of the function

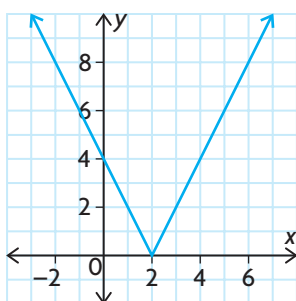
$$f(x) = \frac{2}{5-x}?$$

- a) $\{x \in \mathbf{R} \mid x \neq -5\}$ c) $\{x \in \mathbf{R} \mid x \neq 0\}$
b) $\{x \in \mathbf{R} \mid x \neq 5\}$ d) $\{x \in \mathbf{R}\}$

2. Which of these relations is *not* a function of x ?

- a) $x = -y^2$ c) $y = \sqrt{x-3}$
b) $y = 2x^2$ d) $x + y = 3$

3. Which function can be represented by this graph?



- a) $f(x) = |2x| - 4$ c) $f(x) = |2x - 4|$
b) $f(x) = \left| \frac{1}{2}x - 2 \right|$ d) $f(x) = |2x| + 4$

4. Which best describes

$$f(x) = (x-2)(x+2)?$$

- a) odd c) neither a) nor b)
b) even d) both a) and b)

5. What transformations were applied to $y = |x|$ to obtain the equation $y = \left| \frac{1}{3}(x-2) \right|$?

- a) horizontal compression by a factor of $\frac{1}{3}$,
horizontal translation 2 units to the left
b) horizontal stretch by a factor of 3,
horizontal translation 2 units to the right
c) horizontal translation 2 units to the right,
horizontal stretch by a factor of 3
d) horizontal translation 2 units to the right,
horizontal compression by a factor of $\frac{1}{3}$

6. What is the equation of the parent function

$$\text{of } f(x) = \frac{2}{x-2} - 4?$$

- a) $g(x) = 2^x$ c) $g(x) = x^2$
b) $g(x) = \frac{2}{x}$ d) $g(x) = \frac{1}{x}$

7. The graph of $y = 2^x$ is stretched horizontally by a factor of 5, and then translated 3 units down. Which of the following is the resulting equation?

- a) $f(x) = 2^{5(x-3)}$ c) $f(x) = 5^x - 3$
b) $f(x) = 2^{\frac{1}{5}(x+3)}$ d) $f(x) = 2^{\left(\frac{1}{5}x\right)} - 3$

8. Which function has an inverse with the domain $\{x \in \mathbf{R} \mid x \geq 5\}$?

- a) $y = 2x^2 + 5$ c) $y = 2|x| - 5$
b) $y = 2(x-5)^2$ d) $y = 2|x+5|$

9. Which relation is the inverse of $f(x) = 2x^2 - 4$?

- a) $y = \sqrt{2(x-4)}$
b) $y = \pm \sqrt{2(x-4)}$
c) $y = \pm \sqrt{\frac{x+4}{2}}$
d) $y = \sqrt{\frac{x+4}{2}}$

10. Which function is *not* continuous?

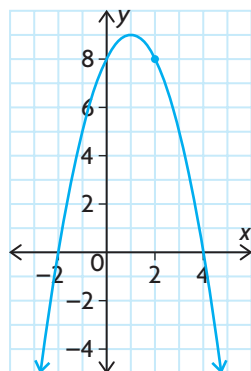
- a) $f(x) = \begin{cases} 2x, & \text{if } x < 1 \\ x+1, & \text{if } x \geq 1 \end{cases}$
b) $f(x) = \begin{cases} (x-2)^2, & \text{if } x \leq 2 \\ \sqrt{x-2}, & \text{if } x > 2 \end{cases}$
c) $f(x) = \begin{cases} \frac{1}{x}, & \text{if } x < -1 \\ -1, & \text{if } x \geq -1 \end{cases}$
d) $f(x) = \begin{cases} 2x+1, & \text{if } x < 2 \\ x+2, & \text{if } x \geq 2 \end{cases}$

11. What is the average rate of change of the function $f(x) = x^3 - 2x^2 + 7$ over the interval $-1 \leq x \leq 3$?
 a) 3 b) 4 c) 12 d) -3
12. Kristin and Husain are growing crystal gardens. Both of them started with a small seed crystal, which had a mass of about 0.1 g. In 3 days, Kristin's crystal grew to a mass of 5 g. In 10 days, Husain's crystal grew to a mass of 15 g. Whose crystal grew faster?
 a) Kristin's
 b) Husain's
 c) The rates are equal.
 d) There is not enough information to decide.
13. A submarine is descending from the surface. What is the best estimate of its instantaneous change in depth at $t = 3$ s?

Time, t (s)	Depth (m)
3	27
3.001	27.015002
3.01	27.1502
3.1	28.52
4	44

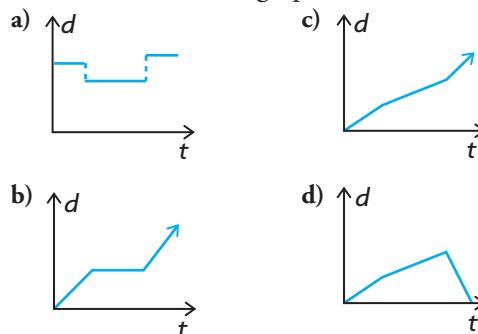
- a) 15.2 m/s
 b) 15.002 m/s
 c) 15 m/s
 d) 17 m/s

14. What is the best estimate of the instantaneous rate of change of $f(x) = 2^x - 2x + 1$ at $x = -1$?
 a) -1.5 b) -3.5 c) -1.625 d) -1.65
15. For the following graph, what is the best estimate of the slope of the tangent at $x = 2$?

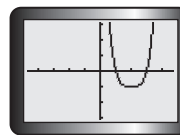


- a) 2
 b) -1
 c) -2
 d) -3

16. An athlete runs the first lap of a race slightly faster than the next two laps, and then runs the final lap the fastest. Which graph is the correct distance versus time graph for the athlete's run?

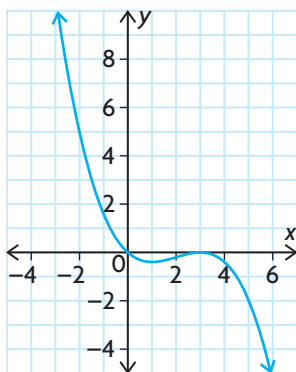


17. At $x = 5$, the function $f(x) = 13x - 1.3x^2 + 7.3$ has
 a) a maximum
 b) a minimum
 c) both a maximum and a minimum
 d) neither a maximum nor a minimum
18. For the function $f(x) = 2x^2 - 3x + 9$, what is the correct expression for the value of the difference quotient on the interval $3 \leq x \leq 3 + h$?
 a) $2h^2 - 3h$ c) $4h - 3$
 b) $4h + 9$ d) $2h + 9$
19. For the growth equation $y = 35(1.7)^x$, the maximum value over the domain $0 \leq x \leq 8$ is
 a) $y = 1.7$ c) $y = 69.7$
 b) $y = 2441.5$ d) $y = 35$
20. Which equation does *not* represent a polynomial function?
 a) $f(x) = x^2 + 2$
 b) $f(x) = (x + 1)(x - 2)(x - 3)(x - 4)$
 c) $f(x) = 2^x - 3$
 d) $f(x) = 3x - 2$
21. Which type of polynomial function *cannot* be represented by the following graph?



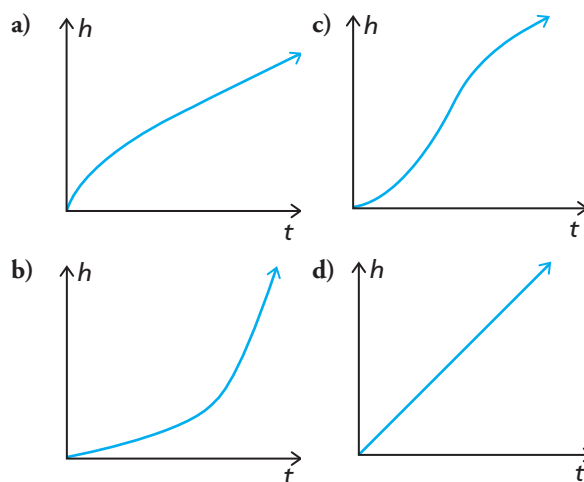
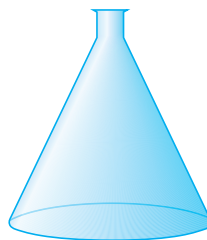
- a) quadratic
 b) cubic
 c) quartic with three turning points
 d) quartic with one turning point

22. Which statement is true for any cubic polynomial function?
- As $x \rightarrow \pm\infty$, $y \rightarrow \infty$.
 - As $x \rightarrow \pm\infty$, the signs of y are opposite.
 - As $x \rightarrow \pm\infty$, $y \rightarrow -\infty$.
 - As $x \rightarrow \pm\infty$, the signs of y are same.
23. Which function could be represented by the following graph?



- $y = 0.1x^2(x - 3)^2$
 - $y = -0.1x(x - 3)^2$
 - $y = -0.1x(x - 3)$
 - $y = -0.1x^2(x + 3)$
24. Which quartic function has zeros at -2 , 0 , 1 , and 3 , and satisfies $f(2) = 16$?
- $f(x) = -2x^4 + 4x^3 + 10x^2 - 12x$
 - $f(x) = 2x^4 - 4x^3 - 10x^2 + 12x$
 - $f(x) = 2x^4 + 4x^3 - 10x^2 - 12x$
 - $f(x) = -2x^4 - 4x^3 + 10x^2 + 12x$
25. $y = x^3$ is stretched horizontally by a factor of 2, and then translated horizontally 3 units to the right. What is the equation of the resulting graph?
- $y = (2(x + 3))^3$
 - $y = \left(\frac{1}{2}x\right)^3 - 3$
 - $y = \left(\frac{1}{2}(x - 3)\right)^3$
 - $y = (2x - 3)^3$
26. $x^3 - 2x^2 + 7x + 12$ is divided by $x^2 - 3x + 4$. What is the remainder?
- $x^2 + 3x + 8$
 - $x + 4$
 - $6x + 8$
 - $-3x + 4$

27. What is the remainder when $x + 3$ is divided into $x^4 - 5x^2 + 12x + 16$?
- 196
 - 88
 - 2
 - 16
28. The polynomial $2x^3 + kx^2 - 3x + 18$ has $x - 3$ as one of its factors. What is the value of k ?
- 4
 - 7
 - 2
 - 2
29. What is $27x^3 - 216$ in factored form?
- $3(x - 2)(x^2 + 2x + 4)$
 - $27(x + 2)(x^2 - 2x + 4)$
 - $27(x - 2)(x^2 + 2x + 4)$
 - $(3x + 6)(9x^2 - 18x + 36)$
30. What are the factors of $(x + 3)^3 + 8$?
- $(x^3 + 27)(8)$
 - $(x + 3)(x^2 - 3x + 17)$
 - $(x + 5)(x^2 + 4x + 7)$
 - $(x + 1)(x^2 - 4x + 7)$
31. The following container is being filled with water at a constant rate. Which graph shows the height of the water level versus time?



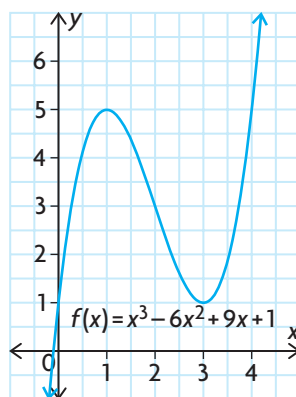
Investigations

Investigating Transformations of a Quadratic and its Inverse

32. a) Sketch the graphs of the parent function $f(x) = x^2$ and its inverse.
 b) Apply various transformations to the graph of the parent function.
 Draw the graph of the inverse of each transformed function.
 c) Describe how you could modify each transformed inverse you drew in part b) to make it into a function.

Investigating Rates of Change in a Cubic Function

33. Investigate various rates of change of the function $f(x) = x^3 - 6x^2 + 9x + 1$. Your investigation should include average rates of change and estimated rates of change at different points, including any maximum or minimum points.



Graphing a Polynomial Function

34. a) Determine the equation of $f(x) = k(x + 1)^2(x - 2)(x - 4)$, if $(1, -24)$ is a point on the graph of $f(x)$.
 b) Solve for p if $(3, p)$ is a point on the graph of $f(x)$.
 c) State the end behaviours and the zeros of $f(x)$.
 d) Determine the y -intercept of $f(x)$.
 e) Use all the characteristics you determined to sketch a possible graph of $f(x)$.