Multiple Choice Questions– fill in the appropriate response.

1) The function $y = |x-5|$ can be written as:

(A) $y = \begin{cases} x-5, & x \geq 5 \\ -x-5, & x < 5 \end{cases}$

(B) $y = \begin{cases} x-5, & x \geq 0 \\ -x-5, & x < 0 \end{cases}$

(C) $y = \begin{cases} x-5, & x \geq 5 \\ -(x-5), & x < 5 \end{cases}$

(D) $y = \begin{cases} x-5, & x \geq 0 \\ -(x-5), & x < 0 \end{cases}$

2) Write $\dfrac{5\sqrt{3}}{2\sqrt{6x}}$ in simplest exact form.

(A) $\dfrac{5\sqrt{18x}}{12x}$

(B) $\dfrac{10\sqrt{18x}}{24x}$

(C) $\dfrac{5\sqrt{2x}}{4x}$

(D) $\dfrac{5\sqrt{2}}{4}$

3) A student tried to solve the radical equation $\sqrt{4x+1}-1=x$ using the following steps. Where is the student's error?

Step I $\sqrt{4x+1} = x+1$

Step II $4x+1 = x^2+1$

Step III $0 = x^2-4x$

Step IV $0 = x(x-4)$

(A) *Step I*

(B) *Step II*

(C) *Step III*

(D) *Step IV*

4) Which of the following is a simplified form of $\dfrac{m^2+7m+12}{4m+12}$, where $m \neq -3$?

(A) $\dfrac{m+3}{3}$

(B) $\dfrac{m+4}{3}$

(C) $\dfrac{m+3}{4}$

(D) $\dfrac{m+4}{4}$

5) Which of the following is equivalent to $\frac{2}{x-3}+\frac{3}{x^2-9}$, $x \neq \pm 3$?

(A) $\frac{5}{x^2+x-12}$

(B) $\frac{5}{x^2-9}$

(C) $\frac{2x-3}{x^2-9}$

(D) $\frac{2x+9}{x^2-9}$

6) State the non-permissible values for $\frac{x+4}{x^3+6x^2+8x}+\frac{x-3}{x+2}$.

(A) $-4, 3$

(B) $0, 2, 4$

(C) $0, \pm 2, \pm 4$

(D) $0, -2, -4$

7) Simplify the expression: $\frac{x+4}{x^3+6x^2+8x}+\frac{x-3}{x+2}$.

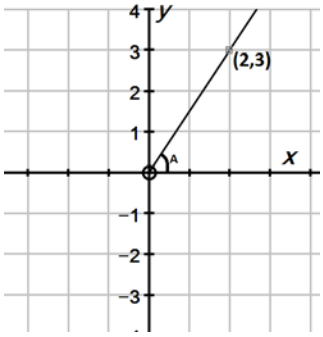
(A) $\frac{x^2-3x}{(x)(x+2)}$

(B) $\frac{x^2-3x+1}{(x)(x+2)}$

(C) $\frac{x^3+x^2-11x+4}{(x)(x+2)(x+4)}$

(D) $\frac{2x+1}{x^3+6x^2+9x+2}$

8) Yin used a computer to plot the point (2,3) on the terminal arm of angle A.



What is the exact value for $\cos(A)$?

(A) $\frac{2\sqrt{13}}{13}$

(B) $\frac{3\sqrt{13}}{13}$

(C) $\frac{\sqrt{13}}{2}$

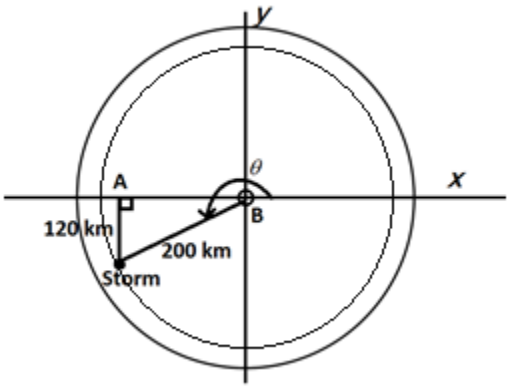
(D) $\frac{\sqrt{13}}{3}$

9) What is the product of $(2\sqrt{7}-4\sqrt{x})(\sqrt{7}+2\sqrt{x})$?

(A) $14-8x$ (B) $14+8x$

(C) $-10+\sqrt{x}$ (D) $2\sqrt{7}-8\sqrt{x}$

10) A storm is developing on a radar screen as shown below. What is the measure of the angle, θ, to the nearest degree?



(A) $211°$ (B) $217°$

(C) $233°$ (D) $239°$

11) Factor: $2(x-1)^2+7(x-1)+3$.

(A) $(x-1)(2x^2+7x+3)$ (B) $(2x+1)(x+3)$

(C) $(2x-1)(x+2)$ (D) $(x+1)(x+2)$

12) The area of a rectangle, in cm^2, is given by the formula $A=6(x^2+4x+3)^2+2(x^2+4x+3)$. The length of the rectangle is $2(x^2+4x+3)\ cm$. What is an expression for the width of this rectangle?

(A) $3x^2+12x+10$ (B) $3x^2+4x+4$

(C) $3x^2+12x+9$ (D) $(3x+1)(x^2+4x+3)$

13) Susan sells t-shirts for $12 each. They cost her $7 each to purchase from her supplier. She is able to sell an average of 90 t-shirts per month. Market research indicates that increasing her selling price by $2 per t-shirt will result in the loss of and average of 10 t-shirts. If n represents the number of $2 increases in price, what equation could you use to model the profit she would make?

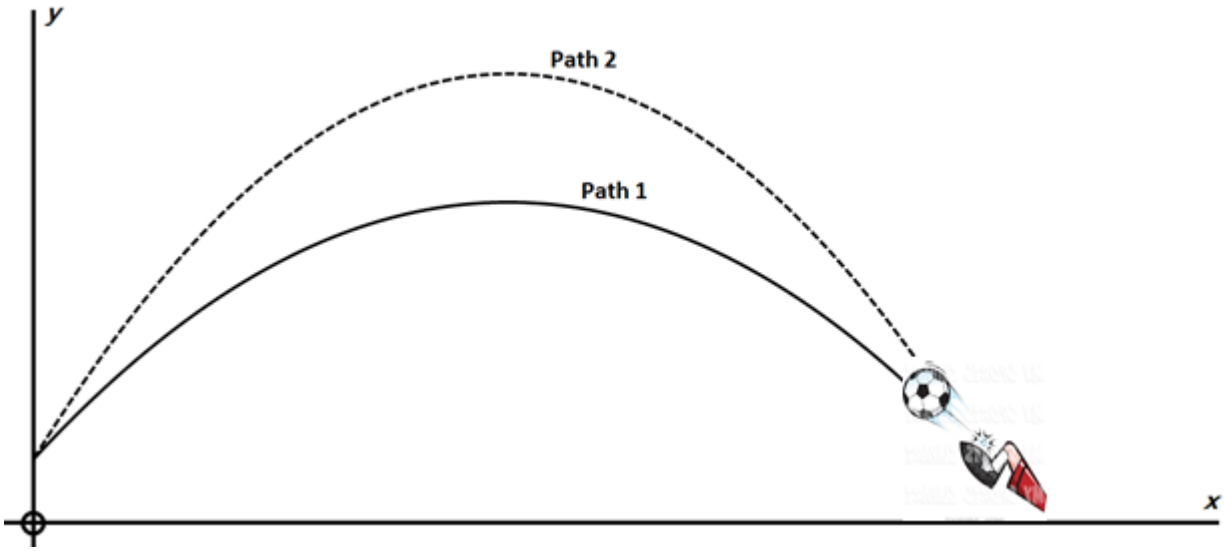
(A) $P = (90 - 10n)(12 + 2n)$

(B) $P = (90 - 10n)(5 + 2n)$

(C) $P = (90 + 2n)(12 - 10n)$

(D) $P = (90 + 2n)(5 - 10n)$

14) A soccer player is trying to increase her shot accuracy. She stays in the same position on the field and increases the arc of the flight path of the ball. Her coach graphs the quadratic function $y = a(x - p)^2 + q$ to model path 1 of the soccer ball. The coach then changes the parameters to graph path 2. To create path 2 from path 1, which parameters did the coach change?

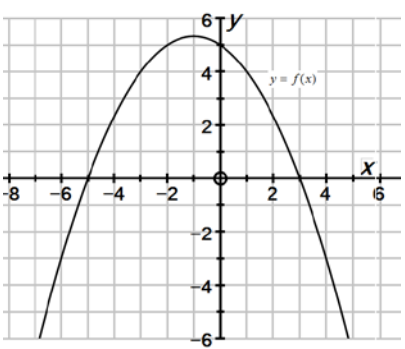


(A) a and p

(B) a and q

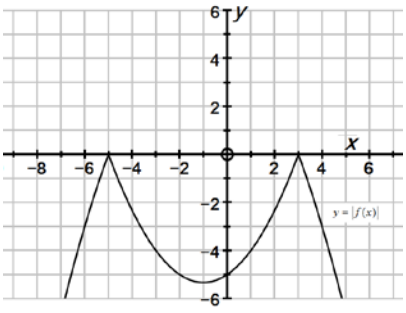
(C) p

(D) q



15) Which of the following is a graph of $|f(x)|$ given the graph of $f(x)$ as shown to the right?

A



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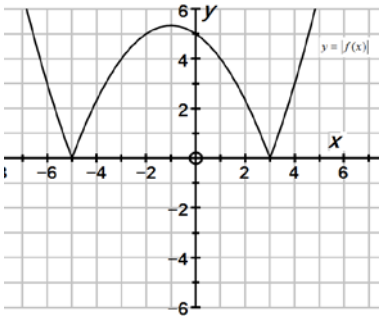
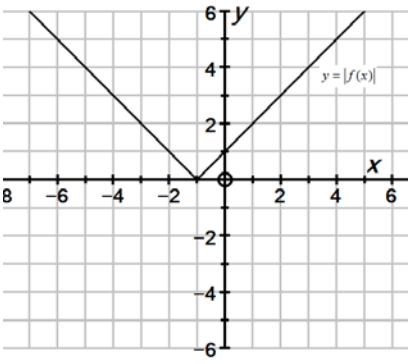


C



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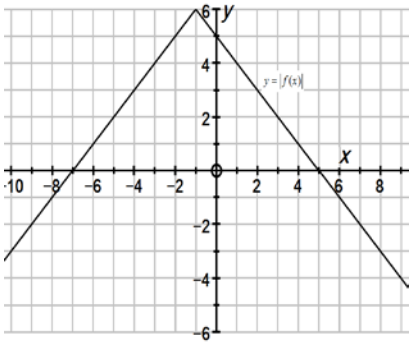


16) For what value(s) of x do $f(x) = -\frac{1}{4}(x-2)^2 + 4$ and $g(x) = \frac{1}{2}x + 1$ intersect?

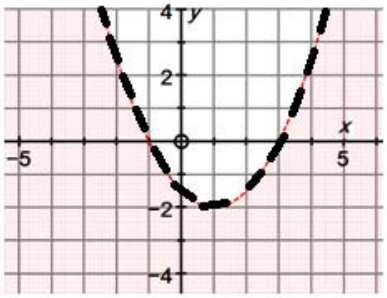
A -2 *and* 4

B 4 *and* 3

C -2 *and* 6

D 0 *and* 3

17) Which of the following in-equations describes the graph shown to the right?



(A) $y > \frac{1}{2}(x+1)(x-3)$ (B) $y \geq \frac{1}{2}(x+1)(x-3)$

(C) $y < \frac{1}{2}(x+1)(x-3)$ (D) $y \leq \frac{1}{2}(x+1)(x-3)$

18) For what values of x is $2x^2 - 5x - 3 > 0$?

(A) $(-\infty, -\frac{1}{2}] \cup [3, \infty)$ (B) $[-\frac{1}{2}, 3]$

(C) $(-\infty, -\frac{1}{2}) \cup (3, \infty)$ (D) $(-\frac{1}{2}, 3)$

19) The consecutive terms of an arithmetic sequence are $t_1, t_2, and\ t_3$. The second sequence is formed by reversing the first sequence to obtain $t_3, t_2, and\ t_1$. If the common difference of the first sequence is d, then what is the common difference of the second sequence?

(A) $\frac{1}{d}$ (B) $-\frac{1}{d}$

(C) d (D) $-d$

20) What is the third term of a geometric sequence in which $t_1 = 64x^8$ and $r = \frac{1}{2x^2}, x \neq 0$?

(A) $16x^2$ (B) $16x^3$

(C) $16x^4$ (D) $32x^6$

21) The cost of renting a medium sized car is $32.00 per day plus $0.12 per kilometre for any distance travelled beyond 100 km per day. After the first 100 km, the company's changes area based of 50 km increments. A chart illustrating the cost of driving the car is shown below.

Number of km	100	150	200	250			800

per day							
Cost ($)	$32	t_2	t_3	t_4			t_n

If $32.00 is the first term in the sequence, then the sequence 32, t_2, t_3, …,t_n can be described as:

(A) An arithmetic sequence with a common difference of 6

(B) An arithmetic sequence with a common difference of 50

(C) A geometric sequence with a common ratio of 6

(D) A geometric sequence with a common ratio of 0.12

22) An infinite geometric series has a first term of 81 and a sum of $\frac{243}{4}$. What is the ratio of this series?

(A) $-\frac{4}{3}$

(B) $-\frac{1}{3}$

(C) $\frac{1}{3}$

(D) $\frac{4}{3}$

23) Which of the following series is convergent?

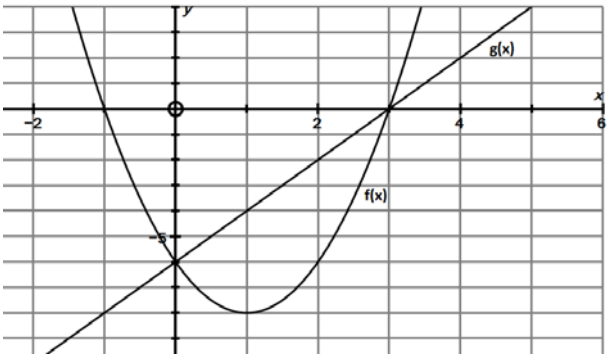
(A) $4+1-2-5-..$

(B) $\sqrt{2}+2+2\sqrt{2}+4+...$

(C) $3200-1600+800-400+...$

(D) $\frac{11}{3}+\frac{8}{3}+\frac{5}{3}+\frac{2}{3}...$

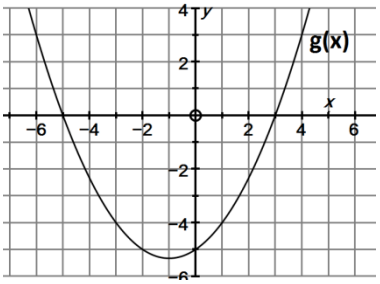
24) Given the linear function $g(x)$, and the quadratic function, $f(x)$ graphed below, when is $f(x) \geq g(x)$?



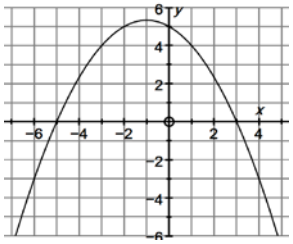
(A) $\{x \mid x \le 0, x \ge 3;\ x \in R\}$ (B) $\{x \mid x < 0, x > 3;\ x \in R\}$

(C) $\{x \mid x \ge 0, x \le 3;\ x \in R\}$ (D) $\{x \mid x > 0, x < 3;\ x \in R\}$

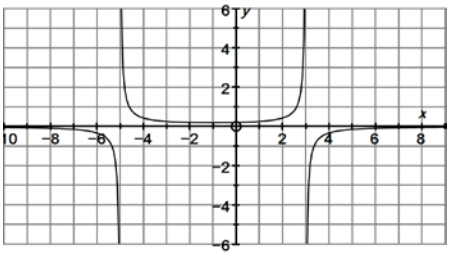
25) The graph of $g(x)$ is shown to the right. Which of the following is a graph of $\frac{1}{g(x)}$?



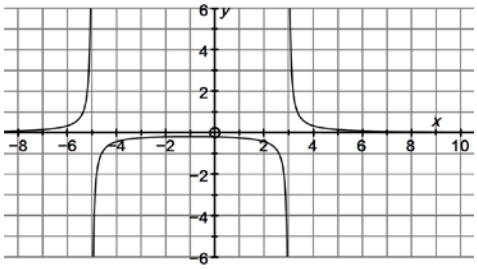
(A)



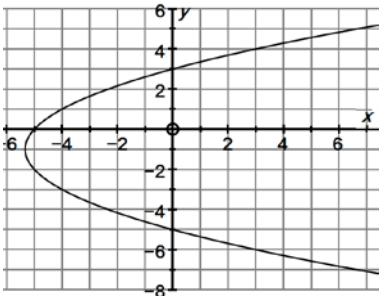
(B)



(C)



(D)



Full Solution Questions – Show all your work.

1. To test for steroids in an athlete, the lab techs know that after a 24-hour period, 15% of the chemical has been eliminated from the bloodstream. If 50 mg were taken initially, how much would be expected to be in the bloodstream at the end of the fifth day?

2. Given that the 1st, 2nd and 3rd terms of an arithmetic sequence are: $11-x$, $2x+1$ and $3x+1$ respectively. Solve for *x* and then find S_{15}.

3. The 3rd, 4th, and 5th terms of a geometric sequence are $x-2$, $x+1$, and $x+7$ respectively. Calculate t_1, and t_2

4. Find the sum of the first 50 terms of an arithmetic sequence in which $t_5 + t_{12} = -53$ and $t_{10} + t_{100} = -332$.

5. Evaluate and simplify $\dfrac{\dfrac{\sin 45°}{\sin 60°} + \cos 30°}{\dfrac{\cos 0°}{\cos 135°} + \sin 135°}$ to obtain a rationalized fraction.

6. Solve the equation $\sin(\theta) = -\dfrac{\sqrt{3}}{2}$ for all values of the angle θ for $0° \le \theta \le 360°$.

7. A rectangle has dimensions of 15cm by 25 cm. The width is decreased by a certain amount while the length is decreased by twice the amount. The area of the rectangle is then decreased by half. What are the new dimensions?

8. A Baseball batter hits a line drive. The height, h, in meters, of the baseball after t seconds is approximately modelled by the function $h(t) = -5t^2 + 40t + 1$.
   a) Demonstrate, algebraically, that this function could also be written as $h(t) = -5(x-4)^2 + 81$.
   b) Without doing any calculations explain what you know about the height of this ball from each of the equations $h(t) = -5t^2 + 40t + 1$ and $h(t) = -5(x-4)^2 + 81$.
   c) Explain how you could use one of these forms of the function to determine, without using the quadratic formula, when the ball would return to its original height.

9. Find the x-intercepts by completing the square in simplest radical form for the following quadratic function, $3x^2 + 6x + 1 = y$.

10. Given 210 meters of fencing, a farmer wants to fence all four sides of a rectangular field, with a divider in the middle. What dimensions will maximize the area of the field and what would this maximum area be?

11. Let A and B be the points of intersection of the parabola $y = x^2 - 8x + 7$ and the x-axis, and let C be the vertex of the parabola. Without graphing this parabola, determine the area of triangle ABC.

12. Solve the equation $\sqrt{5-x} - 3 = x + 4$. Verify your solution(s).

13. For the function $f(x) = 2x^2 - 3x + 4$ determine the exact value for $f(5 + 2\sqrt{3})$.

14. Simplify the following expression $\dfrac{\left(3\sqrt{5m}\right)\left(2\sqrt{5}\right)}{2\sqrt{m} - 4}$.

15. Algebraically solve the equation $2\sqrt{x^2 - 3x - 9} + 1 = 2x - 3$ for all values of x.

16. Solve the following equation: $\dfrac{x^2 - 4x - 12}{x + 3} + \dfrac{x^2 - 7x}{x - 7} = \dfrac{5x + 10}{x + 3} + \dfrac{2x^2 - 14x}{2x - 14}$

17. Simplify the following:

a) $\dfrac{x^2 + 3x - 10}{x^3 + 6x^2 + 5x} \div \dfrac{x^2 - 3x}{x^2 + 5x + 4}$

b) $\dfrac{\dfrac{1 + x}{x} - 2}{2 + \dfrac{1 - x}{x}}$

c) $\dfrac{2x^2 - 5x - 12}{x^2 - 2x - 8} - \dfrac{x^2 + 4x + 8}{x^2 - 4}$

18. Solve the following equation: $\dfrac{7x}{3x + 4} - \dfrac{28x}{2x + 5} = -3$.

19. Show that the following is true $x \neq -1, x \neq 2$.

$$\frac{x^3 - 2x^2}{x^2 - x - 2} - (x - 2) = \frac{x + 2}{x - 1}$$

20. George ran the 600 m race last year but knows if he could run 3 m/s faster this year he could reduce his time by 10 seconds. What was George's time last year?

	Distance (m)	Speed (m/s)	Time (s)
Last year			
This year			

21. Two airplanes are currently 1000 km apart on routes which cross at right angles. One plane flies 100 km an hour faster than the other. What are their speeds if each plane reaches the crossing point in exactly 2 hours.

	Distance (km)	Speed (km/h)	Time (h)
Slower Plane			
Faster Plane			

22. Find all values of m so that $0 = x^2 + mx + 9$ has two distinct real roots.

23. Algebraically solve the system $5x^2 - 3x + 9 - y = 10$ and $6x^2 + 2x - 13 - y = 2$.

24. An engineer determines that she can use the formula $-0.2t^2 + 30 \leq P$ to estimate when the price of carbon fibre will be P dollars per kg or less in t years from the present.

a) When will carbon fibre be available at $10/kg or less?
b) Write and solve an inequality based on the above function for a price of $3/kg or less?
c) Explain why some of the values of t that satisfy the inequality do not solve the problem.

25. Consider the absolute function $y = |3x + 1|$

a) Determine the y-intercept and x-intercepts
b) Sketch the graph
c) State the domain and range
d) Express as a piecewise function

26. Consider the absolute function $f(x) = |x^2 - x - 2|$

a) Determine the y-intercept and x-intercepts
b) Sketch the graph
c) State the domain and range
d) Express as a piecewise function

27. Algebraically solve the following equations.

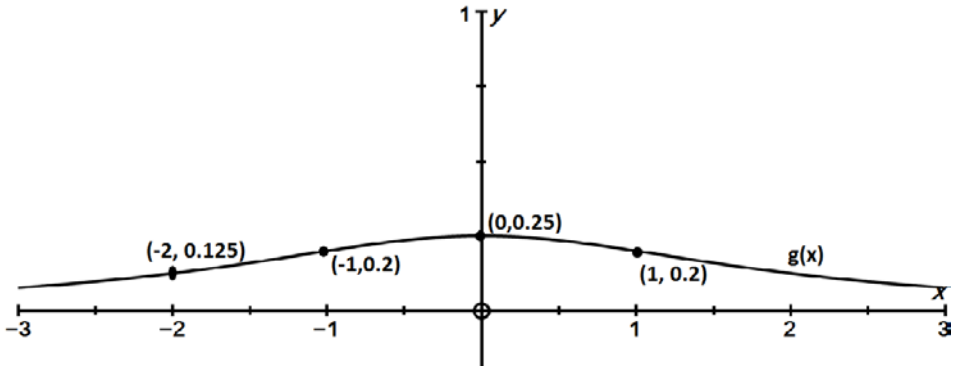
    a. $|x+5| = 4x-1$

    b. $|x-5| = x^2 - 8x + 15$

28. Determine the value of m if $|2x-6| = mx-4$ has exactly one solution at $x = \frac{5}{2}$. Illustrate this solution graphically.

29. Given $f(x) = x^2 - 4x + 4$, graph $y = f(x)$ and its reciprocal function on the same axis. Label any points with f(x) and its reciprocal have in common.

30. Given that $g(x) = \frac{1}{f(x)}$ and that $g(x)$ is graphed below. State a possible equation for $f(x)$.



31. The graph of a reciprocal function of the form $y = \frac{1}{f(x)}$ is shown below. Sketch the graph of the original function, $y = f(x)$ on the axis provided, and determine the equation of the original function.