PRACTICE TEST

Complete pages 201 - 203
Ques. 1-8, 11(a,b), 12(a), 13(a)

Solutions

Multiple Choice

1. Which function is NOT a quadratic function?

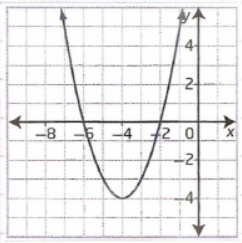
A. $y = 2(x+1)^2 - 7$
$y = 2(x+1)(x+1) - 7$
$y = (2x+2)(x+1) - 7$
$y = 2x^2 + 2x + 2x + 2 - 7$
$y = 2x^2 + 4x - 5$
QUADRATIC

B. $y = (x-3)(2x+5)$
$y = 2x^2 + 5x - 6x - 15$
$y = 2x^2 - 1x - 15$
QUADRATIC

C. $y = 5x^2 - 20$
QUADRATIC

D. $y = 3(x-9) + 6$
$y = 3x - 27 + 6$
$y = 3x - 21$
NOT QUADRATIC

2. Which quadratic function represents the parabola shown?



Opens Upward: $a > 0$
Vertex: $(-4, -4)$

A. $y = (x+4)^2 + 4$
B. $y = (x-4)^2 + 4$
C. $y = (x+4)^2 - 4$
D. $y = (x-4)^2 - 4$

Solutions

3. Identify the range for the function $y = -6(x-6)^2 + 6$. Vertex: (6,6) Opens Downward

A. $\{y \mid y \leq 6, y \in R\}$ C. $\{y \mid y \leq -6, y \in R\}$
B. $\{y \mid y \geq 6, y \in R\}$ D. $\{y \mid y \geq -6, y \in R\}$

4. Which quadratic function in vertex form is equivalent to $y = x^2 - 2x - 5$?

A. $y = (x-2)^2 - 1$
$y = (x-2)(x-2) - 1$
$y = x^2 - 2x - 2x + 4 - 1$
$y = x^2 - 4x + 3$

B. $y = (x-2)^2 - 9$
$y = (x-2)(x-2) - 9$
$y = x^2 - 2x - 2x + 4 - 9$
$y = x^2 - 4x - 5$

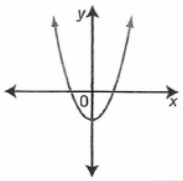
C. $y = (x-1)^2 - 4$
$y = (x-1)(x-1) - 4$
$y = x^2 - 1x - 1x + 1 - 4$
$y = x^2 - 2x - 3$

D. $y = (x-1)^2 - 6$
$y = (x-1)(x-1) - 6$
$y = x^2 - 1x - 1x + 1 - 6$
$y = x^2 - 2x - 5$

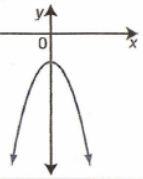
5. Which graph shows the function $y = 1 + ax^2$ if $a < 0$?

↳ $y = ax^2 + 1$ (vertical translation of 1 unit up) (opens downward)

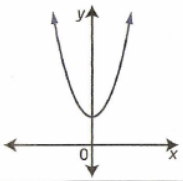
A.



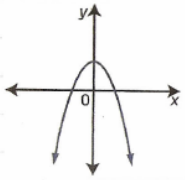
B.



C.



D.



Solutions

6. What conditions on a and q will give the function $f(x) = a(x-p)^2 + q$ no x-intercepts?

A. $a > 0$ and $q > 0$
Opens Upward
Vertex above x-axis
↳ No x-intercepts

B. $a < 0$ and $q > 0$
Opens Downward
Vertex above x-axis.
↳ 2 x-intercepts

C. $a > 0$ and $q = 0$
Opens Upward
Vertex on x-axis
↳ 1 x-intercept

D. $a < 0$ and $q = 0$
Opens Downward
Vertex on x-axis.
↳ 1 x-intercept.

7. Write each quadratic function in vertex form by completing the square.

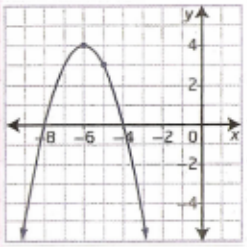
a) $y = x^2 - 18x - 27$
$y = (x^2 - 18x) - 27$
$y = (x^2 - 18x + 81 - 81) - 27$
$y = (x^2 - 18x + 81) - 81 - 27$
$y = (x-9)^2 - 108$

b) $y = 3x^2 + 36x + 13$
$y = 3(x^2 + 12x) + 13$
$y = 3(x^2 + 12x + 36 - 36) + 13$
$y = 3[(x^2 + 12x + 36) - 36] + 13$
$y = 3[(x+6)^2 - 36] + 13$
$y = 3(x+6)^2 - 108 + 13$
$y = 3(x+6)^2 - 95$

Solutions

c) $y = -10x^2 - 40x$
$y = -10(x^2 + 4x)$
$y = -10(x^2 + 4x + 4 - 4)$
$y = -10[(x^2 + 4x + 4) - 4]$
$y = -10[(x+2)^2 - 4]$
$y = -10(x+2)^2 + 40$

8.a) For the graph shown, give the coordinates of the vertex, the equation of the axis of symmetry, the minimum or maximum value, the domain and range, and the x-intercepts.



Vertex: (-6,4)
Axis of Symmetry: ($x = -6$)
Maximum Value: $y = 4$ or (-6,4)
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \leq 4, y \in R\}$
x-intercepts: $x = -4$ and $x = -8$

b) Determine a quadratic function in vertex form for the graph.

$y = a(x-p)^2 + q$
$y = a(x-6)^2 + 4$
$\Rightarrow y = a(x+6)^2 + 4$
$3 = a(-5+6)^2 + 4$
$3 = a(1)^2 + 4$
$3 - 4 = a(1)$
$\frac{-1}{1} = \frac{1a}{1}$
$-1 = a$

$y = -1(x+6)^2 + 4$

Solutions

{a&b}11. The first three steps in completing the square below contain one or more errors.

$y = 2x^2 - 8x + 9$
$y = 2(x^2 - 8x) + 9$
$y = 2(x^2 - 8x \ominus 64 \oplus 64) + 9$

a) Identify and correct the errors.

*Errors circled in red.

b) Correction:

$y = 2x^2 - 8x + 9$
$y = 2(x^2 - 4x) + 9$
$y = 2(x^2 - 4x + 4 - 4) + 9$
$y = 2[(x^2 - 4x + 4) - 4] + 9$
$y = 2[(x-2)^2 - 4] + 9$
$y = 2(x-2)^2 - 8 + 9$
$y = 2(x-2)^2 + 1$

Solutions

12. The fuel consumption for a vehicle is related to the speed that it is driven and is usually given in liters per one hundred Kilometers. Engines are generally more efficient at higher speeds than at lower speeds. For a particular type of car driving at a constant speed, the fuel consumption, C, in litres per one hundred Kilometers, is related to the average driving speed, v, in Kilometers per hour, by the function $C(v) = 0.004v^2 - 0.62v + 30$.

a) Without graphing, determine the most efficient speed at which this car should be driven. Explain/show the strategy you use.

$C = 0.004v^2 - 0.62v + 30$

$C = 0.004(v^2 - 155v) + 30$

$C = 0.004(v^2 - 155v + 6006.25 - 6006.25) + 30$

$C = 0.004[(v^2 - 155v + 6006.25) - 6006.25] + 30$

$C = 0.004[(v - 77.5)^2 - 6006.25] + 30$

$C = 0.004(v - 77.5)^2 - 24.025 + 30$

$C = 0.004(v - 77.5)^2 + 5.975$

Vertex (77.5 , 5.975)

↓ speed ↓ fuel consumption

The most efficient speed at which the car should be driven is 77.5 Km/h.

Solutions

13. The height, h, in meters, of a flare t seconds after it is fired into the air can be modelled by the function $h=-4.9t^2+61.25t$.

a) At what height is the flare at its maximum? How many seconds after being shot does this occur?

$h=-4.9t^2+61.25t$
$h=-4.9(t^2-12.5t)$
$h=-4.9(t^2-12.5t+39.0625-39.0625)$
$h=-4.9[(t^2-12.5t+39.0625)-39.0625]$
$h=-4.9[(t-6.25)^2-39.0625]$
$h=-4.9(t-6.25)^2+191.40625$

Vertex: (6.25, 191.40625)
↑ Time ↑ Height

The maximum height of the flare is 191.40625m and this occurs 6.25s after it is fired.