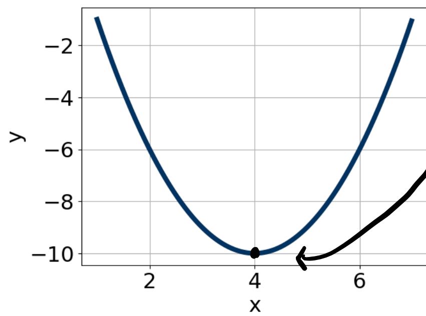
16. Write the equation of the graph presented below in the form $f(x) = ax^2 + bx + c$, assuming $a = 1$ or $a = -1$. Then, choose the intervals that $a, b,$ and c belong to.

★ PARABOLA OPENS UP

$\Rightarrow a > 0$

$\Rightarrow \boxed{a = 1}$



$\boxed{\text{VERTEX IS } (h,k) = (4,-10)}$

$f(x) = a(x-h)^2 + k$

$f(x) = 1(x-4)^2 + (-10)$

$f(x) = (x-4)^2 - 10$

$f(x) = (x-4)(x-4) - 10$

$f(x) = x^2 - 4x - 4x + 16 - 10$

$\boxed{f(x) = x^2 - 8x + 6}$

$a = \boxed{1}$ $b = \boxed{-8}$ $c = \boxed{6}$

A. $a \in [0.4, 1.9], \quad b \in [7, 9], \text{ and } \quad c \in [24, 29]$

B. $a \in [0.4, 1.9], \quad b \in [-13, -7], \text{ and } \quad c \in [24, 29]$

C. $a \in [0, 3], \quad b \in [7, 9], \text{ and } \quad c \in [5, 7]$

D. $a \in [0.4, 1.9], \quad b \in [-13, -7], \text{ and } \quad c \in [5, 7]$

E. $a \in [-2.8, -0.5], \quad b \in [7, 9], \text{ and } \quad c \in [5, 7]$

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17. Graph the equation $f(x) = -(x+4)^2 - 12$.

$f(x) = a(x-h)^2 + k$

$\Rightarrow h = -4$

$k = -12$

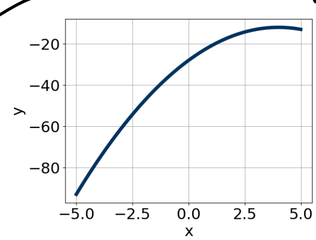
$\Rightarrow$ VERTEX

$(h,k) = (-4,-12)$

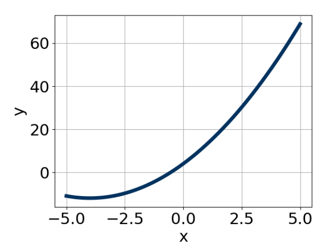
$a = -1$

$\Rightarrow a < 0$

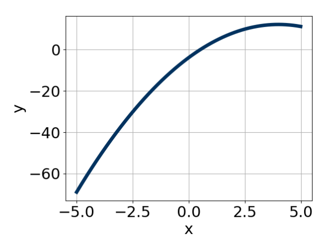
$\Rightarrow$ PARABOLA OPENS DOWN



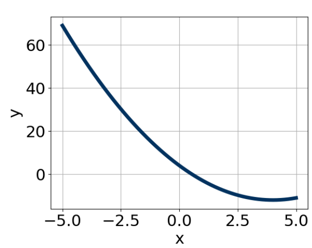
~~A.~~



~~C.~~

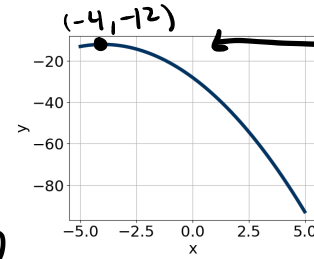


~~D.~~



~~B.~~

(−4,−12)



E.

OPENS DOWN ✓

VERTEX AT (−4,−12) ✓

---

18. Factor the quadratic below. Then, choose the intervals that contain the constants in the form $(ax+b)(cx+d); b \leq d$.

$$64x^2 + 48x + 9$$

$a = \boxed{8}$ $b = \boxed{3}$ $c = \boxed{8}$ $d = \boxed{3}$

A. $a \in [0.5, 1.5]$, $b \in [2, 5]$, $c \in [63.5, 64.5]$, and $d \in [1.5, 3.5]$

B. $a \in [0.5, 1.5]$, $b \in [-3.5, -1.5]$, $c \in [63.5, 64.5]$, and $d \in [-4.5, -2.5]$

C. $a \in [15.5, 17]$, $b \in [2, 5]$, $c \in [3, 4.5]$, and $d \in [1.5, 3.5]$

D. $a \in [7, 9]$, $b \in [2, 5]$, $c \in [7, 8.5]$, and $d \in [1.5, 3.5]$

E. $a \in [3, 4.5]$, $b \in [2, 5]$, $c \in [15, 17]$, and $d \in [1.5, 3.5]$

$64x^2 = (8x)^2$

$9 = 3^2$

DOES $2(8x)(3) = 48$?

$(16x)(3) = 48$ ✓

YES!

$a^2 + 2ab + b^2 = (a+b)^2$

$64x^2 + 48x + 9$

$= (8x)^2 + 2(8x)(3) + 3^2$

$= (8x+3)^2$

$= (8x+3)(8x+3)$

19. Solve the quadratic equation below. Then, choose the intervals that the solutions x_1 and x_2 belong to, with $z_1 \leq z_2$.

$$144x^2 - 16 = 0$$

$x_1 = \boxed{-0.\overline{3}}$ $x_2 = \boxed{0.\overline{3}}$

A. $x_1 \in [-0.2, -0.05]$ and $x_2 \in [0.99, 1.09]$

B. $x_1 \in [-0.07, 0]$ and $x_2 \in [3.83, 4.02]$

C. $x_1 \in [-0.8, -0.65]$ and $x_2 \in [0.06, 0.3]$

D. $x_1 \in [-4.13, -3.98]$ and $x_2 \in [-0.07, 0.05]$

E. $x_1 \in [-0.52, -0.15]$ and $x_2 \in [0.28, 0.41]$

★ $a^2 - b^2 = (a+b)(a-b)$

$144x^2 - 16 = 0$

$(12x)^2 - 4^2 = 0$

$(12x+4)(12x-4) = 0$

$12x + 4 = 0$ $12x - 4 = 0$

$12x = -4$ $12x = 4$

$x = -\frac{4}{12}$ $x = \frac{4}{12}$

$x = -\frac{1}{3}$ $x = \frac{1}{3}$

20. Solve the quadratic equation below. Then, choose the intervals that the solutions belong to, with $x_1 \leq x_2$ (if they exist).

$$-7x^2 + 7x + 7 = 0$$

$x_1 = \boxed{-0.618}$ $x_2 = \boxed{1.618}$

A. $x_1 \in [-3.6, -1.5]$ and $x_2 \in [0.5, 0.7]$

B. $x_1 \in [-1.6, 0.1]$ and $x_2 \in [1.5, 2.5]$

C. $x_1 \in [-11.4, -8.8]$ and $x_2 \in [3.7, 4.7]$

D. $x_1 \in [-5.3, -4.1]$ and $x_2 \in [11.3, 11.9]$

E. There are no Real solutions.

QUADRATIC FORMULA:

$x = \dfrac{-7 \pm \sqrt{7^2 - 4(-7)(7)}}{2(-7)}$

$x = \dfrac{-7 \pm \sqrt{49 + 196}}{-14}$

$x = \dfrac{-7 \pm \sqrt{245}}{-14} = \dfrac{-7 \pm \sqrt{49 \cdot 5}}{-14}$

$x = \dfrac{-7 \pm 7\sqrt{5}}{-14} = \dfrac{-7}{-14} \pm \dfrac{7\sqrt{5}}{-14} = \boxed{\dfrac{1}{2} \pm \dfrac{\sqrt{5}}{-2}}$