Assignment

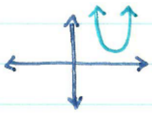
Complete pgs. 258 - 260

Questions 3, 6ac, 7, 9ab, 10, 13, 16, 18, 19

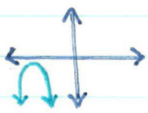
Solutions

3. Explain what must be true about the graph of the corresponding function for a quadratic equation to have no real roots.

For a quadratic equation to have no real roots, its corresponding graph must open upward and have a vertex above the x-axis or open downward and have a vertex below the x-axis.



OR



6. Factor.

a) $4x^2-13x+9$

$(x-\frac{4}{4})(x-\frac{9}{4})$

$(x-1)(4x-9)$

$-4 \times -9 = 36$
$-4 + -9 = -13$

c) $3(v+1)^2+10(v+1)+7$

Let $r=v+1$

$3r^2+10r+7$

$(r+\frac{3}{3})(r+\frac{7}{3})$

$(r+1)(3r+7)$

$(v+1+1)[3(v+1)+7]$

$(v+2)(3v+3+7)$

$(v+2)(3v+10)$

$3 \times 7 = 21$
$3 + 7 = 10$

Solutions

7. Solve by factoring.

a) $0 = x^2 + 10x + 21$ $\quad \underline{3} \times \underline{7} = 21$

$0 = (x+3)(x+7)$ $\quad \underline{3} + \underline{7} = 10$

$x+3=0$ or $x+7=0$

$x=-3 \qquad x=-7$

b) $\frac{1}{4}m^2 + 2m - 5 = 0$ $\quad (\div \frac{1}{4} \Rightarrow \times 4)$

$\frac{1}{4}(m^2 + 8m - 20) = 0$ $\quad \underline{10} \times \underline{-2} = -20$

$\underline{10} + \underline{-2} = 8$

$\frac{1}{4}(m+10)(m-2)=0$

$m+10=0$ or $m-2=0$

$m=-10 \qquad m=2$

c) $5p^2 + 13p - 6 = 0$ $\quad \underline{15} \times \underline{-2} = -30$

$(p+\frac{15}{5})(p-\frac{2}{5})=0$ $\quad \underline{15} + \underline{-2} = 13$

$(p+3)(5p-2)=0$

$p+3=0$ or $5p-2=0$

$p=-3 \qquad \frac{\cancel{5}p}{\cancel{5}} = \frac{2}{5}$

$p = \frac{2}{5}$

d) $0 = 6z^2 - 21z + 9$

$0 = 3(2z^2 - 7z + 3)$ * Remove Common Factor First

$0 = 3(z - \frac{6}{2})(z - \frac{1}{2})$ $\quad \underline{-6} \times \underline{-1} = 6$

$\underline{-6} + \underline{-1} = -7$

$0 = 3(z-3)(2z-1)$

$z-3=0$ or $2z-1=0$

$z=3 \qquad \frac{\cancel{2}z}{\cancel{2}} = \frac{1}{2}$

$z = \frac{1}{2}$

Solutions

9. Write a quadratic equation in standard form with the given roots.

a) 2 and 3

↳ $(x-2)(x-3)=0$ *Opposite signs
$x^2-3x-2x+6=0$
$x^2-5x+6=0$

b -1 and -5

↳ $(x+1)(x+5)=0$ * Opposite Signs
$x^2+5x+1x+5=0$
$x^2+6x+5=0$

Solutions

10. The path of a paper airplane can be modelled approximately by the function $h(t) = -\frac{1}{4}t^2 + t + 3$, where h is the height above the ground, in meters, and t is the time of flight, in seconds. Determine how long it takes for the paper airplane to hit the ground, $h(t) = 0$.

$$-\frac{1}{4}t^2 + t + 3 = 0$$

$$-\frac{1}{4}(t^2 - 4t - 12) = 0$$

$$-\frac{1}{4}(t+2)(t-6) = 0$$

$t + 2 = 0$ or $t - 6 = 0$

$t = -2$ $\quad$ $t = 6$

$\uparrow$
Extraneous Root

It takes 6 s for the paper airplane to hit the ground.

Solutions

13. Determine the value of K that makes each expression a perfect square trinomial.

a) $x^2 + 4x + K$

$K = \left(\frac{4}{2}\right)^2$

$K = \frac{16}{4}$

$K = 4$

b) $x^2 + 3x + K$

$K = \left(\frac{3}{2}\right)^2$

$K = \frac{9}{4}$

Solutions

16. In a simulation, the path of a new aircraft after it has achieved weightlessness can be modelled approximately by $h(t) = -5t^2 + 200t + 9750$, where h is the altitude of the aircraft, in meters, and t is the time, in seconds, and weightlessness is achieved. How long does the aircraft take to return to the ground, $h(t) = 0$? Express your answer to the nearest tenth of a second.

$\hookrightarrow -5t^2 + 200t + 9750 = 0$

$-5(t^2 - 40t - 1950) = 0$

a =1, b = -40, and c = -1950

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{40 \pm \sqrt{(-40)^2 - 4(1)(-1950)}}{2(1)}$$

$$t = \frac{40 \pm \sqrt{1600 + 7800}}{2}$$

$$t = \frac{40 \pm \sqrt{9400}}{2}$$

$$t = \frac{40 - \sqrt{9400}}{2} \quad or \quad t = \frac{40 + \sqrt{9400}}{2}$$

$$t = -28.5 \quad or \quad t = 68.5$$

$\uparrow$ Extraneous Root

The aircraft takes approximately 68.5 s to return to the ground.

Solutions

18. Use the discriminant to determine the nature of the roots for each quadratic equation. Do not solve the equation.

a) $2x^2 + 11x + 5 = 0$ $a=2, b=11, c=5$

$D = b^2 - 4ac$
$= (11)^2 - 4(2)(5)$
$= 121 - 40$
$= 81$

Since $D>0$, there are 2 real roots.

b) $4x^2 - 4x + 1 = 0$ $a=4, b=-4, c=1$

$D = b^2 - 4ac$
$= (-4)^2 - 4(4)(1)$
$= 16 - 16$
$= 0$

Since $D=0$, there is one real root.

c) $3p^2 + 6p + 24 = 0$ $a=3, b=6, c=24$

$D = b^2 - 4ac$
$= (6)^2 - 4(3)(24)$
$= 36 - 288$
$= -252$

Since $D<0$, there are no real roots.

Solutions

d) $4x^2+4x-7=0$ $a=4, b=4, c=-7$

$$D = b^2-4ac$$
$$= (4)^2-4(4)(-7)$$
$$= 16+112$$
$$= 128$$

Since $D>0$, there are 2 real roots.

19. Use the quadratic formula to determine the roots for each quadratic equation. Express your answers as exact values.

a) $-3x^2-2x+5=0$ $a=-3, b=-2, c=5$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$= \frac{2 \pm \sqrt{(-2)^2-4(-3)(5)}}{2(-3)}$$
$$= \frac{2 \pm \sqrt{4+60}}{-6}$$
$$= \frac{2 \pm \sqrt{64}}{-6}$$
$$= \frac{2 \pm 8}{-6}$$

$x = \frac{2-8}{-6}$ or $x = \frac{2+8}{-6}$

$x = \frac{-6}{-6}$ $\quad x = \frac{10}{-6}$

$x = 1$ $\quad x = -\frac{5}{3}$

Solutions

b) $5x^2+7x+1=0$ $a=5, b=7, c=1$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-7\pm\sqrt{(7)^2-4(5)(1)}}{2(5)}$$

$$x=\frac{-7\pm\sqrt{49-20}}{10}$$

$$x=\frac{-7\pm\sqrt{29}}{10}$$

c) $3x^2-4x-1=0$ $a=3, b=-4, c=-1$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{4\pm\sqrt{(-4)^2-4(3)(-1)}}{2(3)}$$

$$x=\frac{4\pm\sqrt{16+12}}{6}$$

$$x=\frac{4\pm\sqrt{28}}{6}$$

d) $25x^2+90x+81=0$ $a=25, b=90, c=81$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-90\pm\sqrt{(90)^2-4(25)(81)}}{2(25)}$$

$$x=\frac{-90\pm\sqrt{8100-8100}}{50}$$

$$x=\frac{-90\pm\sqrt{0}}{50}$$

$$x=\frac{-90}{50}$$

$$x=-\frac{9}{5}$$