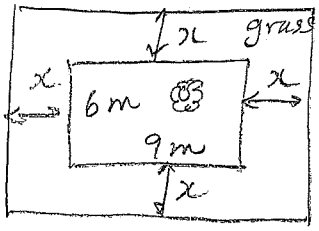
PreCal 11

Solutions

copy to post

Ch 4 Practice Test #14, 6, 7, 8, 9

p. 262 #14 Walkway Problem



$l = 6+2x$

$w = 9+2x$

Variables

let $6+2x$ = length of outside of path

$9+2x$ = width of outside of path

A = area

$A_{flowerbed} = 9 \times 6 = 54\ m^2$

$A_{flowerbed} = A_{path}$ (same)

a) $A_{all} = (9+2x)(6+2x)$

$54 + 54 = 54 + (18x+12x) + 4x^2$

$4x^2 + 30x - 54 = 0$

b) $\frac{4x^2 + 30x - 54}{2} = \frac{0}{2}$

$2x^2 + (15x) - 27 = 0$ (decompose)

$2x^2 + -3x + 18x - 27 = 0$

$2(-27) = -54$

-3×18

$-3 + 18 = 15$

$x(2x-3) + 9(2x-3) = 0$

$(x+9)(2x-3) = 0$

$x+9=0$ OR $2x-3=0$

$x = -9$ OR $\frac{2x}{2} = \frac{3}{2}$

Reject because can't have a negative measurement

$x = 1.5$

$\therefore$ the width of the path is 1.5m.

c) Perimeter = distance all around

$= 2[9+2(1.5)] + 2[6+2(1.5)] = 2(12) +$ (4 sides)

$= 2(12) + 2(9) = 24 + 18 = \boxed{42\ m}$

Practice Test Chapter 4

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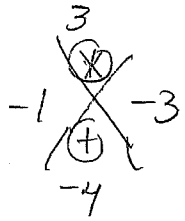
6a $0 = x^2 - 4x + 3$



$(x^2 + -x) + (-3x + 3) = 0$

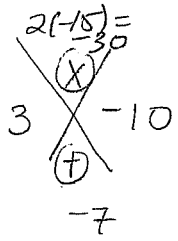
$x(x-1) + -3(x-1) = 0$

$(x-3)(x-1) = 0$

$\therefore x - 3 = 0$ OR $x - 1 = 0$

$\boxed{x = 3 \quad \text{OR} \quad x = 1}$

b $0 = 2x^2 - 7x - 15$



$(2x^2 + 3x) + (-10x - 15) = 0$

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

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

$x = 5$ OR $2x + 3 = 0$

$\boxed{x = 5 \quad \text{OR} \quad x = -\frac{3}{2}}$

c $0 = -x^2 - 2x + 3$

$x^2 + 2x - 3 = 0 \qquad a = 1,\ b = 2,\ c = -3$

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

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

$$= \frac{-2 \pm \sqrt{4 + 12}}{2}$$

$$= \frac{-2 \pm \sqrt{16}}{2} = \frac{-2 \pm 4}{2}$$

$$= \frac{-2+4}{2} \quad \text{OR} \quad \frac{-2-4}{2}$$

$$= \frac{2}{2} = 1 \quad \text{OR} \quad \frac{-6}{2} = -3$$

$\boxed{\{1, -3\}}$

Practice Test Ch 4

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7. Solve by completing the square.

$0 = 3x^2 + 5x - 1$

$\frac{3x^2 + 5x - 1}{3} = \frac{0}{3}$

$x^2 + \frac{5}{3}x - \frac{1}{3} \times 12 = 0$ $\qquad \frac{b}{2} = \frac{\frac{5}{3}}{2} = \frac{5}{6} \rightarrow \left(\frac{5}{6}\right)^2 = \frac{25}{36}$

$x^2 + \frac{5}{3}x + \frac{25}{36} - \frac{25}{36} - \frac{12}{36}$

$\left(x + \frac{5}{6}\right)^2 - \frac{37}{36} = 0$

$+\frac{37}{36}$ $\qquad +\frac{37}{36}$

$\sqrt{\left(x + \frac{5}{6}\right)^2} = \pm\sqrt{\frac{37}{36}}$

$x + \frac{5}{6} = \pm\frac{\sqrt{37}}{6}$

$-\frac{5}{6}$ $\qquad -\frac{5}{6}$

$$\boxed{x = \frac{-5 \pm \sqrt{37}}{6}}$$

8. $x^2 + 4x - 7 = 0$

$a = 1, b = 4, c = -7$ $\qquad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(-7)}}{2(1)} = \frac{-4 \pm \sqrt{16 + 28}}{2} = \frac{-4 \pm \sqrt{44}}{2}$

$= \frac{-4 \pm \sqrt{(2 \cdot 2)11}}{2} = \frac{-4 \pm 2\sqrt{11}}{2} = \boxed{-2 \pm \sqrt{11}}$

1
11 | 11
2 | 22
2 | 44

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9) Determine nature of roots:

discriminant, b^2-4ac: >0 (pos.) → 2 real roots; $=0$ → 1 real root; <0 (neg.) → 0 real roots

a) $x^2+10x+25=0$

$a=1,\ b=10,\ c=25$

$b^2-4ac = 10^2-4(1)(25)$

$= 100-100$

$=0$ ∴ 1 real root (2 equal roots)

b) $2x^2+x=5$

$2x^2+x-5=0$ $\quad a=2,\ b=1,\ c=-5$

$b^2-4ac = 1^2-4(2)(-5)$

$= 1+40$

$=41>0$ ∴ 2 real distinct roots

c) $2x^2+6=4x$

$2x^2-4x+6=0$ $\quad a=2,\ b=-4,\ c=6$

$b^2-4ac = (-4)^2-4(2)(6)$

$= 16-48$

$=-32<0$ ∴ 0 real roots

d) $3\left(\frac{2}{3}x^2+\frac{1}{2}x-3\right)=0$ $\times 3$

$2x\left(2x^2+\frac{3}{2}x-9\right)=0$ $\times 2$

$4x^2+3x-18=0$ $\quad a=4,\ b=3,\ c=-18$

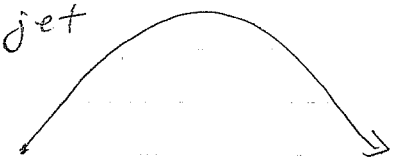
$b^2-4ac = 3^2-4(4)(-18) = 9+648$

$= 657>0$ ∴ 2 real distinct roots

Ch 4 Review

p. 260 (for 4.4 Quad Formula)

20 water jet



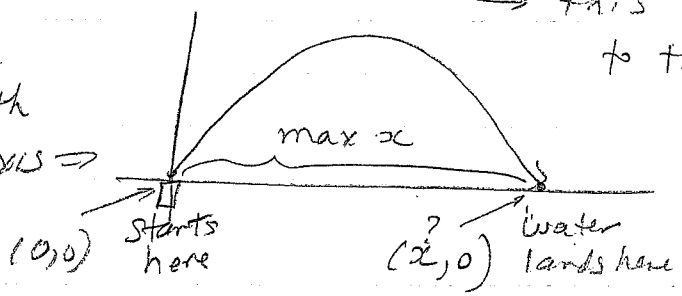
$h(x) = -2x^2 + 6x + 1$

↑ height in m at horizontal distance, x metres from jet

a) What quadratic equation would you solve to determine the max. horizontal distance the water jet can reach?

↳ this corresponds to the further x-intercept ∴ ⇒ find the roots!

Picture the water's path on x-y axis ⇒



$-2x^2 + 6x + 1 = 0$

b) Solve to get max horizontal distance water jet can reach.

$a = -2, \quad b = 6, \quad c = 1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{36 - 4(-2)(1)}}{2(-2)}$$

$$= \frac{-6 \pm \sqrt{36 + 8}}{-4} = \frac{-6 \pm \sqrt{44}}{-4}$$

44 = 2 · 22 = 2 · 2 · 11

$$= \frac{-6 \pm \sqrt{2 \cdot 2 \cdot 11}}{-4} = \frac{-6 \pm 2\sqrt{11}}{-4}$$

$$= \frac{-3 \pm \sqrt{11}}{2} = \frac{-3 + \sqrt{11}}{2} \text{ OR } \frac{-3 - \sqrt{11}}{2}$$

3.12

cont. – Ch 4 review

Take the difference to find the distance between the 2 roots:

$$\frac{-3+\sqrt{11}}{2} - \left(\frac{-3-\sqrt{11}}{2}\right)$$

$$= \frac{-3+\sqrt{11}}{2} + \frac{3+\sqrt{11}}{2}$$

$$= \frac{2\sqrt{11}}{2} = \boxed{3.3 \text{ m}}$$

(book has ~~3.2 m~~)

Note: Solution by completing the square.

$$\frac{-2x^2+6x+1}{-2} = \frac{0}{-2}$$

$$x^2 - 3x - \frac{1}{2} = 0 \qquad \frac{b}{2} = \frac{-3}{2} \rightarrow \left(\frac{-3}{2}\right)^2 = \frac{9}{4}$$

$$x^2 - 3x + \frac{9}{4} - \frac{9}{4} - \frac{2}{4} = 0$$

$$\left(x - \frac{3}{2}\right)^2 - \frac{11}{4} = 0$$

$$\sqrt{\left(x-\frac{3}{2}\right)^2} = \pm\sqrt{\frac{11}{4}}$$

$$x - \frac{3}{2} = \pm\frac{\sqrt{11}}{2}$$

$$x = \frac{3 \pm \sqrt{11}}{2}$$

P. 258 Ch 4 Review

16 $h(t) = -5t^2 + 200t + 9750$ ← height, time. How long does aircraft take to return to ground, $h(t) = 0$?

$$\frac{-5t^2 + 200t + 9750 = 0}{-5} \quad \frac{}{-5}$$

$$t^2 + 40t - 1950 = 0$$

$\frac{b}{2} = \frac{40}{2} = 20 \rightarrow 20^2 = 400$

$$t^2 + 40t + 400 - 400 - 1950 = 0$$

$$(t+20)^2 - 2350 = 0$$

$$\sqrt{(t+20)^2} = \pm\sqrt{2350}$$

$$t + 20 = \pm 5\sqrt{94}$$

$$t = -20 \pm 5\sqrt{94}$$

$$t = -20 + 5\sqrt{94} \quad \text{OR} \quad t = -20 - 5\sqrt{94}$$

To find the distance between the 2 roots, do bigger-# minus smaller#

$$-20 + 5\sqrt{94} - (-20 - 5\sqrt{94})$$
$$= -20 + 5\sqrt{94} + 20 + 5\sqrt{94}$$

from Boards ↓ "40" $t = \boxed{68.5 \text{ sec}}$

Write quadratic equation in standard form given roots:

a) $\frac{2}{3}$ & -4 ⇒

$\therefore x = \frac{2}{3}$ OR $x = -4$

$3x = 2$; $x + 4 = 0$

$3x - 2 = 0$

$\Rightarrow (3x-2)(x+4) = 3x^2 + 12x - 2x - 8$

$\Leftrightarrow 3x^2 + 10x - 8 = 0$

b) 0 & $\frac{5}{2}$ are roots

$\therefore x = 0$ OR $x = \frac{5}{2}$

$(2)x = \frac{5}{2}(2)$

$2x = 5$

$2x - 5 = 0$

$\therefore (x)(2x-5) = 0$

$2x^2 - 5x = 0$