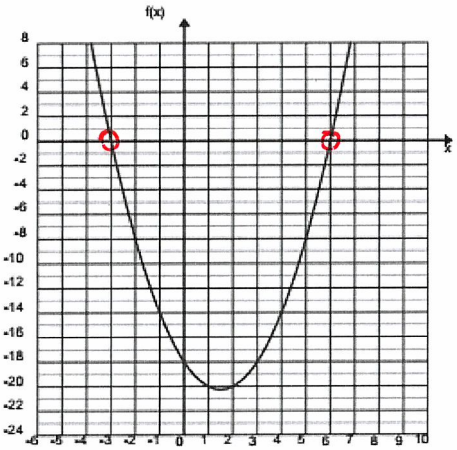
PRE CAL 20

CHAPTER 4 REVIEW

#1. Solve the equation $x^2 - 3x - 18 = 0$ by **analyzing the graph** of the function $f(x) = x^2 - 3x - 18$. **Verify BOTH your answers!** (2 marks)



Sol'ns: $\{-3, 6\}$

#2. **Factor** each of the following:
(1 mark each = 4 marks)

a) $x^2 - 100$ $(x-10)(x+10)$

b) $x^2 - 2x - 24$ $(x-6)(x+4)$

c) $x^2 + 20x + 100$ $(x+10)^2$

d) $3x^2 - 6x$ $3x(x-2)$

#3. **Factor** each of the following:
(2 marks each = 4 marks)

a) $\frac{1}{2}x^2 - \frac{3}{2}x - 2$ $\rightarrow x^2 - 3x - 4$ $\frac{1}{2}(x-4)(x+1)$

* take out GCF by ÷ by $\frac{1}{2}$ (or multiplying by 2)

b) $3x^2 - 13x - 10$

	x	-5
$3x$	$3x^2$	$-15x$
2	$2x$	-10

-30: $1, 30$; $2, 15$; $3, 10$ $(3x+2)(x-5)$

#4. **Factor** each of the following: (3 marks each = 6 marks)

a) $9(a-4)^2 - 25(7b)^2$ difference of squares question

$(3(a-4) - 5(7b))(3(a-4) + 5(7b))$

$(3a - 12 - 35b)(3a - 12 + 35b)$

b) $3(v+1)^2 + 10(v+1) + 7$ → substitute to make it easier.

$3x^2 + 10x + 7$ Let $x = (v+1)$

$(3x+7)(x+1)$

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

$(3v+3+7)(v+2)$ $\Rightarrow (3v+10)(v+2)$

#5. Solve by **factoring.** (2 mark each = 8 marks)

a) $6(x+5)(8x-7) = 0$

$x+5=0$ $\quad 8x-7=0$

$x=-5$ $\quad \frac{8x}{8} = \frac{7}{8}$

$x = \frac{7}{8}$ $\quad \{-5, \frac{7}{8}\}$

b) $4x^2 + 16 = -20x$

GCF! $4x^2 + 20x + 16 = 0$

$4(x^2 + 5x + 4) = 0$

$4(x+4)(x+1) = 0$ $\quad \{-4, -1\}$

c) $x^2 = 6x + 7$

$x^2 - 6x - 7 = 0$

$(x-7)(x+1)$ $\quad \{-1, 7\}$

$x-7=0$ $\quad x+1=0$

$x=7$ $\quad x=-1$

d) $3x^2 - 8x - 3 = 0$

#6. Solve for each of the following using the **Square Root Method**.

a) $7p^2 - 7 = 203$ (2 marks)

$+7 \quad +7$

$\frac{7p^2}{7} = \frac{210}{7}$

$\sqrt{p^2} = \sqrt{30}$

$p = \pm\sqrt{30}$

b) $3(x+2)^2 + 5 = 12$ (3 marks)

$-5 \quad -5$

$\frac{3(x+2)^2}{3} = \frac{7}{3}$

$\sqrt{(x+2)^2} = \sqrt{\frac{7}{3}}$

$x + 2 = \pm\sqrt{\frac{7}{3}}$

$-2 \quad -2$

$x = -2 + \sqrt{\frac{7}{3}}, -2 - \sqrt{\frac{7}{3}}$

#7. Solve by "**completing the square**" and then using the **Square Root Method**. State your answers in EXACT form. (7 marks)

a) $x^2 + 4x + 1 = 0$ (3 marks)

$x^2 + 4x = -1$

$x^2 + 4x + 4 = -1 + 4$

$\sqrt{(x+2)^2} = \sqrt{3}$

$x + 2 = \pm\sqrt{3}$

$-2 \quad -2$

$x = -2 + \sqrt{3}, -2 - \sqrt{3}$

b) $-2x^2 - 6x + 3 = 0$ (4 marks)

{You must use fractions when **completing the square** for full marks}

$-2x^2 - 6x = -3$

$-2\left(x^2 + 3x + \frac{9}{4}\right) = -3 + \left(-\frac{9}{2}\right)$

$\frac{-2\left(x + \frac{3}{2}\right)^2}{-2} = \frac{-15}{2} \div -2$

$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{\frac{15}{4}}$

$x + \frac{3}{2} = \pm\sqrt{\frac{15}{4}}$

$-\frac{3}{2} \quad -\frac{3}{2}$

$x = -\frac{3}{2} + \frac{1}{2}\sqrt{15}, -\frac{3}{2} - \frac{1}{2}\sqrt{15}$

$-\frac{6}{2} + \left(-\frac{9}{2}\right) = -\frac{15}{2}$

$-\frac{15}{2} \cdot -\frac{1}{2} = \frac{15}{4}$

$\sqrt{\frac{15}{4}} = \frac{\sqrt{15}}{\sqrt{4}} = \pm\frac{\sqrt{15}}{2}$

answers $\left\{\pm\sqrt{\frac{15}{4}} - \frac{3}{2}\right\}$

#8. Solve each of the following using the **Quadratic Formula**. State your answers in EXACT form. (3 marks each = 6 marks)

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

$a = 3$, $b = 2$, $c = -3$

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

$x = \frac{-2 \pm \sqrt{40}}{6}$

$\sqrt{40} = \sqrt{4 \cdot 10} = 2\sqrt{10}$

$x = \frac{-2 \pm 2\sqrt{10}}{6}$

$x = -\frac{1}{3} + \frac{1}{3}\sqrt{10}, -\frac{1}{3} - \frac{1}{3}\sqrt{10}$

b) $2x^2 - 5x = 10 - 3x^2$

$2x^2 + 3x^2 - 5x - 10 = 0$

$5x^2 - 5x - 10 = 0$

$a = 5$, $b = -5$, $c = -10$

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(5)(-10)}}{2(5)}$

$x = \frac{5 \pm \sqrt{225}}{10}$

$x = \frac{5 \pm 15}{10}$

$x = -1, 2$

$x = \frac{5+15}{10}$ $\quad x = \frac{5-15}{10}$

$x = \frac{20}{10} = 2$ $\quad x = \frac{-10}{10} = -1$

b^2-4ac

#9. Determine the **value of the discriminant** and **state the nature of the roots.** Do not solve the equation. (2 marks each = 6 marks)

a) $3x^2 + 6x + 24 = 0$

$a=3$ $b=6$ $c=24$

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

Zero roots because discriminant is negative.

b) $4x^2 + 4x - 7 = 0$

$a=4$ $b=4$ $c=-7$

$42-4(4)(-7)$
$16-(-112)$
$16+112$
128

two roots because discriminant is positive.

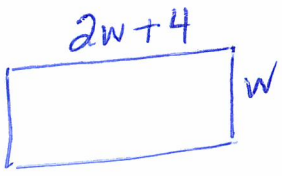
c) $4x^2 - 4x + 1 = 0$

$a=4$ $b=-4$ $c=1$

$(-4)^2-4(4)(1)$
$16-16$
0

only one root because discriminant is zero.

#10. The length of a rectangle is 4cm more than twice the width. Its area is $48cm^2$. Find the dimensions of the rectangle. You must create a quadratic equation and solve it for full marks. (4 marks)



$A = l \times w$
$48 = w(2w+4)$
$48 = 2w^2+4w$
$0 = 2w^2+4w-48$
$0 = 2(w^2+2w-24)$
$0 = 2(w+6)(w-4)$
$w+6=0$ $w-4=0$
$w=-6$ $w=4$

Width = 4
Length = $2(4)+4$
$= 8+4$
$= 12$

The dimensions are 13.2m by 6.8m

#11. There is 40m of fencing to enclose a rectangular pen. Determine the length and width of the pen so that the pen has an area of $90m^2$. You must create a quadratic equation and solve it for full marks. State your final answers to the **nearest tenth** of a metre. (4 marks)

$P = 2l+2w$
$40 = 2l+2w$
$\frac{40-2l}{2} = \frac{2w}{2}$
$20-l = w$

$A = l \cdot w$
$90 = l(20-l)$
$90 = 20l-l^2$
$l^2-20l+90 = 0$
can't factor!!

$l^2-20l+100 = -90+100$
$\sqrt{(l-10)^2} = \sqrt{10}$
$l-10 = \pm\sqrt{10}$
$l = 10 \pm \sqrt{10}$
$l = 10 \pm 3.2$

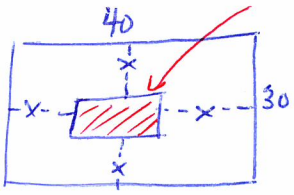
then width
$20-13.2 = 6.8$
or
$20-6.8 = 13.2$

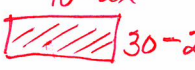
$l = 13.2$ or $l = 6.8$

$a=1$ $b=-20$ $c=90$

$$\frac{+20 \pm \sqrt{(-20)^2-4(1)(90)}}{2(1)}$$
$$\frac{20 \pm \sqrt{400-360}}{2}$$
$$\frac{20 \pm \sqrt{40}}{2}$$
$$= \frac{20+6.3}{2} \quad \frac{20-6.3}{2}$$
$$= 13.2 \quad = 6.85$$

#12. Chris cuts half of a rectangular lawn. 40m by 30m, by mowing strips of equal width around the perimeter. Jerri cuts the small rectangle left over. How wide a strip does Chris cut so that they share the work equally (ie. they cut the same area of the lawn)? You must create a quadratic equation and solve it for full marks. (4 marks)





$(40-2x)(30-2x) = 600$
$1200-80x-60x+4x^2 = 600$
$1200-140x+4x^2 = 600$
$-600 \quad -600$
$600-140x+4x^2 = 0$
$4x^2-140x+600 = 0$
$4(x^2-35x+150) = 0$
$4(x-5)(x-30)$
$x-5=0$ $x-30=0$
$x=5$ $x=30$
does not work

Verify
$(40-2(5))(30-2(5))$
$(40-10)(30-10)$
$(30)(20)$
$= 600\ m^2$

Chris cuts a strip 5 m wide.