Pre-Calc Review #2 QUADRATICS

"s there a GCF? - Always check this 1st!

Difference of 2 perfect squares?

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

Ex $4x^2 - 25 = (2x+5)(2x-5)$

Perfect Trinomial Squares?

$a^2 + 2ab + b^2$

$a^2 - 2ab + b^2$

$= (a \pm b)^2$

Ex. $4x^2 + 20x + 25 = (2x+5)^2$

Ex. $16x^2 - 24x + 9 = (4x-3)^2$

4 term factor by grouping

$x^3 + x^2 - 5x - 5$

$x^2(x+1) - 5(x+1)$ match

$= (x+1)(x^2-5)$

Factor each expression completely

8) $m^2 - 6m + 8$

$(m-4)(m-2)$

9) $16x^2 + 56x + 49$

$(4x+7)^2$

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

$(x-5)(x+2)$

11) $r^3 + 3r^2 - 54r$

$= r(r^2 + 3r - 54)$

$= r(r+9)(r-6)$

12) $4a^2 + a - 3$

$= (a+1)(4a-3)$ ☺

13) free space!

14) $2t^3 + 32t^2 + 128t$

$= 2t(t^2 + 16t + 64)$

$= 2t(t+8)^2$

15) $4x^6 - 4x^2$

$= 4x^2(x^4 - 1)$

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

16) $6n^2 - 11n - 2$

$= (n-2)(6n+1)$ ☺

17) $-35 + 16y + 3y^2$

$= 3y^2 + 16y - 35$

$= (3y-5)(y+7)$ ☺

18) $x^2 - 22x + 121$

$= (x-11)^2$

19) $16x^2 - 49$

$= (4x+7)(4x-7)$

Solve each quadratic equation. Leave answers in simplest radical form.

20) $5x^2 = 6 - 13x$ $x = 2/5 \quad x = -3$

$5x^2 + 13x - 6 = 0$

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

$5x - 2 = 0 \qquad x + 3 = 0$

$x = 2/5 \qquad x = -3$

21) $2x^2 = 250$ $x = \pm 5\sqrt{5}$

$2x^2 = 250$

$x^2 = 125$

$x = \pm\sqrt{125}$

$= \pm\sqrt{25}\sqrt{5} = \pm 5\sqrt{5}$

22) $2x^2 + 3x = 1$ $\frac{-3 \pm \sqrt{17}}{4}$

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

$(2x \;\; 1)(x \;\; 1) = 0$

DNF

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

$= \frac{-3 \pm \sqrt{9+8}}{4} = \frac{-3 \pm \sqrt{17}}{4}$

23) $(2x - 5)(x + 1) = 2$ $x = \frac{3 \pm \sqrt{65}}{4}$ use QF.

↑ not = 0

must multiply out!

$2x^2 + 2x - 5x - 5 = 2$

$2x^2 - 3x - 7 = 0$

$(2x \quad)(x \quad) = 0$ ∴

24) $(2x + 7)^2 = 25$ $x = -1, -6$

Use $\pm\sqrt{}$

$2x + 7 = \pm\sqrt{25}$

$2x + 7 = 5 \qquad 2x + 7 = -5$

$2x = -2 \qquad 2x = -12$

$x = -1 \qquad x = -6$

25) $45x - 30x^2 + 5x^3 = 0$ $x = 0, 3$

$5x(x^2 - 6x + 9) = 0$

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

$x = 0 \qquad x = 3$

26) $3x^2 - 27 = 0$

$3x^2 = 27$

$x^2 = 9$

$x = \pm\sqrt{9} = \pm 3$

27) $x^3 + 4x^2 - x - 4 = 0$ $x = -4, -1, 1$

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

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

↑ keep gang!

$(x+4)(x+1)(x-1) = 0$

$x = -4, -1, 1$

28) $4x^2(x - 10)(x + 4) = 0$

$x = 0 \quad x = 10 \quad x = -4$

Applications of Quadratics and Polynomials:

29. Calculators are sold to students for 20 dollars each. Three hundred students are willing to buy them at that price. For every 5 dollar increase in price, there are 30 fewer students willing to buy the calculator. What selling price will produce the maximum revenue and what will the maximum revenue be?

Let x = # price increases.

Price	X	Quantity	=	Revenue
20		300		6000
25		270		
30		240		
35		210		
⋮		⋮		

Xmin = 0
Xmax = 10
Ymin = 0
Ymax = 10,000

$(20+5x)(300-30x) = R$ calc. max → x = 3
Then sub that into correct ~~expression~~ y = 7350

Selling price = $20+5x$ ($35) maximum revenue = ($7350) Y value of calc max.

30. At a swim meet, Janet dives from a diving board. Her position above the water is represented by the equation $y = -16x^2 + 24x + 40$, where x represents the time in seconds and y represents the height above the water.

a) After how many seconds does Janet enter the water (Hint: the height above the water would equal zero.)

$0 = -16x^2 + 24x + 40$

Algebraic (2.5 secs)

$0 = -8(2x^2 - 3x - 5)$

$0 = (2x-5)(x+1)$

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

$2.5 = x$ $x = -1$

options GC

$y_1 = -16x^2 + 24x + 40$

CALC ZERO

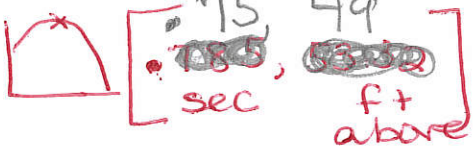
time { Xmin = 0, Xmax = 6, Ymin = 0 or below, Ymax = 50 } to get calc zero

b) What is the greatest height that Janet reaches in her dive? When does she reach that height?

option 1: CALC MAX. The y value will be the height.

Option 2: $x = \frac{-b}{2a}$ = x coord. of vertex. Then sub it into eq. to find y.

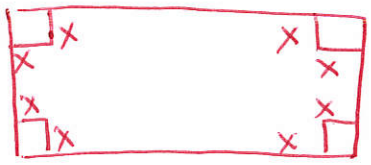
Calc max



(.75 sec, 49 ft above water)

31. An open box is to be made from a 10 inch by 16 inch sheet of cardboard by cutting squares out of the four corners and folding up the sides. What dimensions of the box will yield the largest volume? What is the maximum volume of the box? (12 in by 6 in by 2 in , 144 cubic in)

Sketch & Label:



10

16

T

$10-2x$

L

$16-2x$

V = LWH

$V = (16-2x)(10-2x)(x)$

$x_{min} = 0$

$x_{max} = 5$ (no box!)

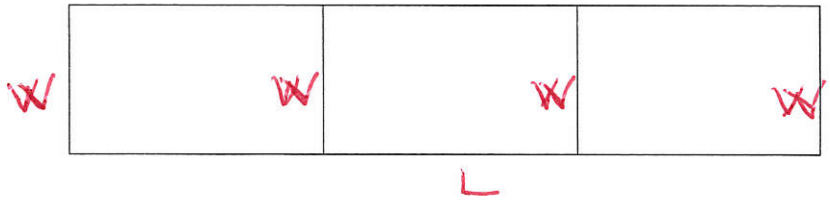
$y_{min} = 0$

$y_{max} = ?$ 250 ? 300 ?

Use calc max.

$x = 2$ max. vol = 144 in^3

32. An ecologist is conducting a research project on breeding pheasants in captivity. She must first construct suitable pens. She wants a rectangular region with two additional fences as shown in the diagram. Find the maximum area that can be enclosed with 3000 meters of fencing. (w = 375m, l = 750m, area = 281,250 square meters)



A = LW

3000 = $4w + 2L$

$\frac{3000-4w}{2} = L$

Solve for one of the variables above. Then substitute for this variable into your Area formula. Find the maximum area.

$A = \left[\frac{3000-4w}{2}\right](w)$

$A = (1500-w)(w)$

let $x \Rightarrow w$

$y \Rightarrow A$

$x_{min} = 0$

$x_{max} = 400$?

$y_{min} = 0$

$y_{max} = ?$ big