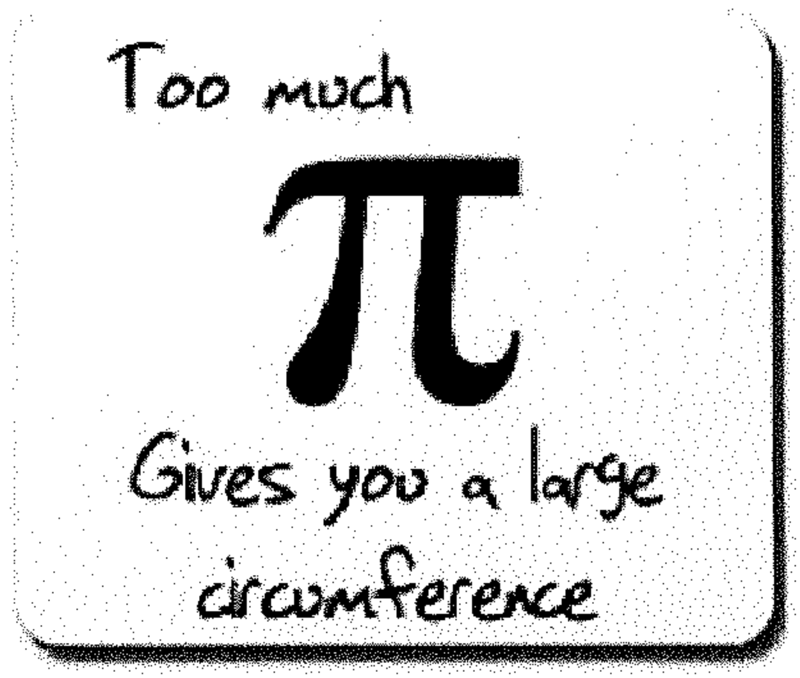
Unit 3 Review



REVIEW

ex: Determine the most efficient method for solving each quadratic equation below. Explain your reasoning. You cannot use a method more than once. Then, SOLVE for the roots!

a) $3x^2 - 6x + 1 = -x$

b) $4 + 3(x - 7)^2 = -80$

c) $15x^2 - 37x = 8$

REVIEW

ex: Determine the most efficient method for solving each quadratic equation below. Explain your reasoning. You cannot use a method more than once. Then, SOLVE for the roots!

a) $3x^2 - 6x + 1 = -x$ $\Rightarrow$ $3x^2 - 5x + 1 = 0$

$\quad +x \qquad\qquad +x$

$\boxed{QF}$

+3 1 3

b) $4 + 3(x-7)^2 = -80$ $\boxed{SR}$

vertex form

c) $15x^2 - 37x = 8$ $\Rightarrow$ $15x^2 - 37x - 8 = 0$

$\quad -8 \qquad\qquad -8$

$\boxed{\text{factor}}$

−120

+3 −40 ✓

solve w/ QF

a) $3x^2 - 6x + 1 = -x$

$\quad +x \qquad +x$

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

$a = 3$
$b = -5$
$c = 1$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{5 \pm \sqrt{25 - 12}}{6}$$

$$\boxed{x = \frac{5 \pm \sqrt{13}}{6}}$$

Solve w/ SR

b) $4+3(x-7)^2=-80$

$-4 \qquad\qquad -4$

$$\frac{3(x-7)^2}{3}=\frac{-84}{3}$$

$$\sqrt{(x-7)^2}=\sqrt{-28}$$

$-1 \quad 4 \quad 7$

$$|x-7|=2i\sqrt{7}$$

$$x-7=\pm 2i\sqrt{7}$$

$$\boxed{x=7\pm 2i\sqrt{7}}$$

Solve w/ factoring

c) $15x^2 - 37x = 8$

-120

$\frac{15x}{+3}$ $\div 3$ $\frac{5x}{+1}$ $\frac{15x}{-40}$ $\div 5$ $\frac{3x}{-8}$

$15x^2 - 37x - 8 = 0$

$(5x + 1)(3x - 8) = 0$

$5x + 1 = 0$
$\quad -1 \quad -1$

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

$3x - 8 = 0$
$\quad +8 \quad +8$

$\frac{3x}{3} = \frac{8}{3}$

$\boxed{x = -1/5,\ 8/3}$

REVIEW

ex: Use the discriminant to describe the number and type of solutions.

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

b) $x^2 - x - 2 = 7x - 18$

REVIEW

ex: Use the discriminant to describe the number and type of solutions.

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

$b^2 - 4ac$

$(-1)^2 - 4(3)(4)$

$1 - 48$

Discriminant: -47

Number: 2 distinct

Type: imaginary

REVIEW

ex: Use the discriminant to describe the number and type of solutions.

b) $x^2 - x - 2 = 7x - 18$

$-7x + 18 \quad -7x + 18$

$x^2 - 8x + 16 = 0$

$b^2 - 4ac$

$(-8)^2 - 4(1)(16)$

$64 - 64$

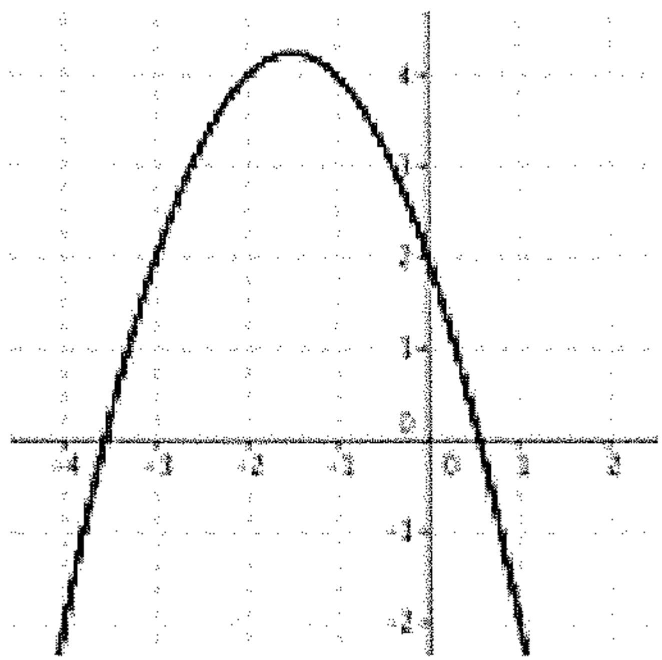
Discriminant: 0

Number: 2 repeated

Type: real

REVIEW

ex: The graph of $y = ax^2 + bx + c$ or the solutions of $ax^2 + bx + c = 0$ are given. Determine if the discriminant is positive, negative, or zero.



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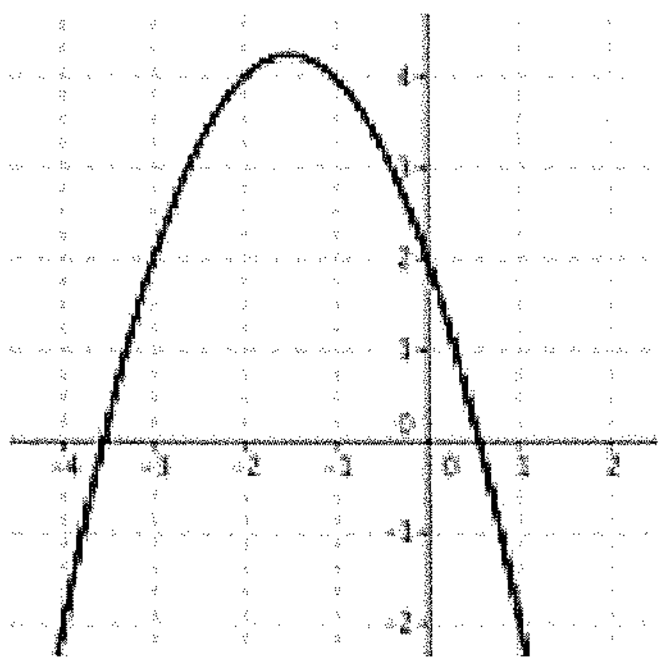
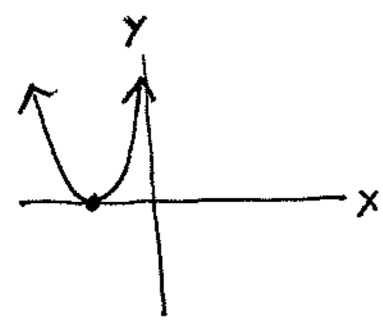
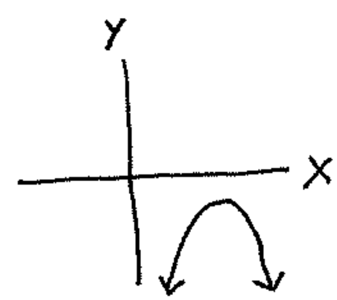


positive

+, 2 x-intercepts



0, 1 x-intercept (repeated solution)



$\overline{}$ negative, 0 x-intercepts

REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

$$h(t) = -16t^2 + 112t$$

a) When will the ball reach its maximum height?

REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

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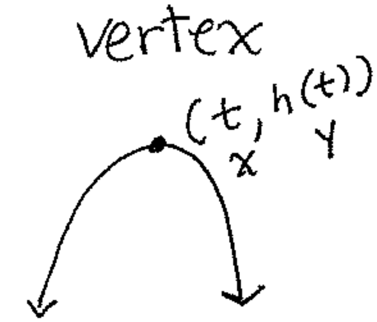
a) When will the ball reach its $\boxed{\text{maximum height?}}$



$t = ?$

$$t = \frac{-b}{2a}$$

$$t = \frac{-(112)}{2(-16)} = \frac{+112}{+32} \div 2$$

$$= \frac{56}{16} \div 2 = \frac{28}{8} \div 4 = \frac{7}{2}$$

$$\boxed{\frac{7}{2} \text{ sec}}$$

REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

$$h(t) = -16t^2 + 112t$$

b) What is the maximum height?

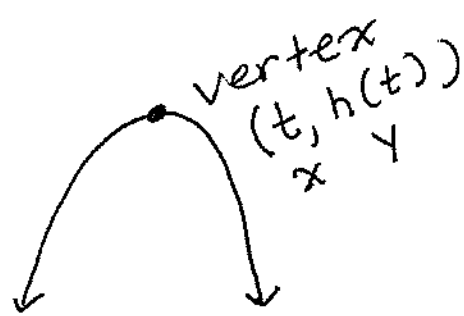
REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

$$h(t) = -16t^2 + 112t$$

b) What is the maximum height?

$t = \frac{7}{2}$ sec



$$h\left(\tfrac{7}{2}\right) = -16\left(\tfrac{7}{2}\right)^2 + 112\left(\tfrac{7}{2}\right)$$

$$= -\overset{-4}{\cancel{16}}\left(\frac{49}{\underset{1}{\cancel{4}}}\right) + \overset{56}{\cancel{112}}\left(\frac{7}{\underset{1}{\cancel{2}}}\right)$$

$$= -196 + 392$$

$$= \boxed{196 \text{ feet}}$$

REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

$$h(t) = -16t^2 + 112t$$

c) When will the ball hit the ground?

REVIEW

ex: Alex throws a ball straight up toward the roof of an indoor baseball stadium. The height h in feet of the ball after t seconds can be modeled by the function

$$h(t) = -16t^2 + 112t$$

c) When will the ball hit the ground?

$h(t) = 0$ feet (not $t = 0$)

height

time

$$0 = \frac{-16t^2}{-16t} + \frac{112t}{-16t}$$

$$\begin{array}{r} 7 \\ 16\overline{)112} \\ -112 \\ \hline 0 \end{array}$$

factor GCF

$$0 = -16t(t-7)$$

$\frac{-16t}{-16} = \frac{0}{-16}$ | $t - 7 = 0$

$t = 0$ | $t = 7$

$\boxed{7 \text{ seconds}}$

REVIEW

ex: Write a quadratic function, f(x), with integral coefficients in standard form.

zeros: $-2/3$, 8

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zeros: -2/3, 8

work backwards...

$x = \frac{-2}{3}$ $\quad x = 8$

$3x = -2$ $\quad (x-8) = 0$

$(3x+2) = 0$

$$f(x) = (x-8)(3x+2)$$

$$f(x) = 3x^2 + 2x - 24x - 16$$

$$\boxed{f(x) = 3x^2 - 22x - 16}$$

REVIEW

ex: Find the zeros of $f(x)=3x^2+60$.

REVIEW

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$$0 = 3x^2 + 60$$

$$\frac{-60}{3} = \frac{3x^2}{3}$$

$$\sqrt{-20} = \sqrt{x^2}$$

$$\sqrt{-1}\sqrt{4}\sqrt{5} = |x|$$

$$2i\sqrt{5}$$

$$x = \pm 2i\sqrt{5}$$

ex: Simplify. $\frac{2}{2+\sqrt{2}}$

multiply by the conjugate

$$\frac{2}{(2+\sqrt{2})} \cdot \frac{(2-\sqrt{2})}{(2-\sqrt{2})}$$

FOIL

$$\frac{4-2\sqrt{2}}{4-\cancel{2\sqrt{2}}+\cancel{2\sqrt{2}}-2}$$

$$\frac{4-2\sqrt{2}}{2}$$

$$\frac{4}{2} - \frac{2\sqrt{2}}{2}$$

$$\boxed{2-\sqrt{2}}$$

REVIEW

ex: The product of two consecutive even whole numbers is equal to 24 more than four times the first number. Find the numbers.

REVIEW

$\{0, 1, 2, 3, 4, 5, \ldots\}$

ex: The product of two consecutive even whole numbers is equal to 24 more than four times the first number. Find the numbers.

add

mult.

Let $1^{st}\# = n$

$2^{nd}\# = n + 2$ (even)

$$n(n+2) = 4n + 24$$

$$\begin{array}{rcl} n^2 + 2n &=& 4n + 24 \\ -4n - 24 & & -4n \quad -24 \end{array}$$

$$n^2 - 2n - 24 = 0$$

$$(n-6)(n+4) = 0$$

$n = 6$ | $\cancel{n = -4}$ not a whole #

so... $2^{nd}\#$

$= n + 2$

$= 6 + 2$

$= 8$

Answer: $\boxed{6 \text{ and } 8}$

REVIEW

ex: Tell whether the statement is always, sometimes, or never true.

a) Quadratic equations have real solutions.

REVIEW

ex: Tell whether the statement is always, sometimes, or never true.

b) Quadratic equations have 2 solutions.

REVIEW

ex: Tell whether the statement is always, sometimes or never true.

c) Quadratic equations have 2 distinct solutions.

REVIEW

ex: Tell whether the statement is always, sometimes, or never true.

d) Roots of quadratic equations are conjugate pairs.

Solutions

REVIEW

ex: Tell whether the statement is always, sometimes, or never true.

e) Imaginary numbers are also real numbers.