Solutions to Test ① Study Guide

① Find zeros of quadratic equation

$$x^2 - 12x = 2x + 32$$

Ⓐ Get standard Form

$$x^2 - 12x = 2x + 32$$
$$\underline{-2x \qquad -2x}$$

$$x^2 - 14x = 32$$

$$x^2 - 14x - 32 = 32 - 32$$

$$\boxed{x^2 - 14x - 32 = 0}$$

Ⓑ $\boxed{a = 1 \quad b = -14 \quad c = -32}$

Ⓒ $D = b^2 - 4ac = (-14)^2 - 4(1)(-32)$

$$\boxed{D = 324}$$

Ⓓ Use Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{14 \pm \sqrt{324}}{2}$$

Ⓔ Get two zeros

$$x = \frac{14 + \sqrt{324}}{2} = \frac{14 + 18}{2}$$

$$\boxed{x = \frac{32}{2} = 16}$$

OR

$$x = \frac{14 - \sqrt{324}}{2} = \frac{14 - 18}{2}$$

$$\boxed{x = -\frac{4}{2} = -2}$$

② Find Roots of quadratic equation

$$x^2 - 12x = 2x^2 + 52$$

Ⓐ Get standard form

$$x^2 - 12x = 2x^2 + 52$$
$$-x^2 \qquad\qquad -x^2$$
$$-12x = 1x^2 + 52$$
$$-12x + 12x = 1x^2 + 52 + 12x$$
$$\boxed{0 = 1x^2 + 12x + 52}$$

Ⓑ $\boxed{a = 1 \quad b = 12 \quad c = 52}$

Ⓒ $D = b^2 - 4ac \rightarrow D = (12)^2 - 4(1)(52)$

$$\boxed{D = -64}$$

Ⓓ use Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-12 \pm \sqrt{-64}}{2}$$

$$x = \frac{-12 \pm \sqrt{-64}}{2}$$ (imaginary solutions or roots)

$$x = \frac{-12 \pm 8i}{2} \rightarrow \boxed{x = \frac{-12 + 8i}{2} = -6 + 4i}$$

$$\rightarrow \boxed{x = \frac{-12 - 8i}{2} = -6 - 4i}$$

③ Find the solutions of quadratic equation $3x^2-10x=2x^2-32$

Ⓐ Get standard form

$$\begin{array}{rcl} 3x^2-10x & = & 2x^2-32 \\ -2x^2 & & -2x^2 \\ \hline 1x^2-10x & = & -32 \end{array}$$

$$1x^2-10x+32=-32+32$$

$$\boxed{1x^2-10x+32=0}$$

Ⓑ $a=1$ $b=-10$ $c=32$

Ⓒ $D=b^2-4ac \Rightarrow D=(-10)^2-4(1)(32)$

$$\boxed{D=-28}$$

imaginary solutions

Ⓓ Use Quadratic Formula

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{10\pm\sqrt{-28}}{2}$$

Ⓔ Get solutions

$$x=\frac{10\pm\sqrt{-4}\sqrt{7}}{2}=\frac{10\pm 2i\sqrt{7}}{2}$$

$$\boxed{x=5\pm i\sqrt{7}}$$

$$\boxed{x=5+i\sqrt{7}}$$

$$\boxed{x=5-i\sqrt{7}}$$

Parts of a Parabola

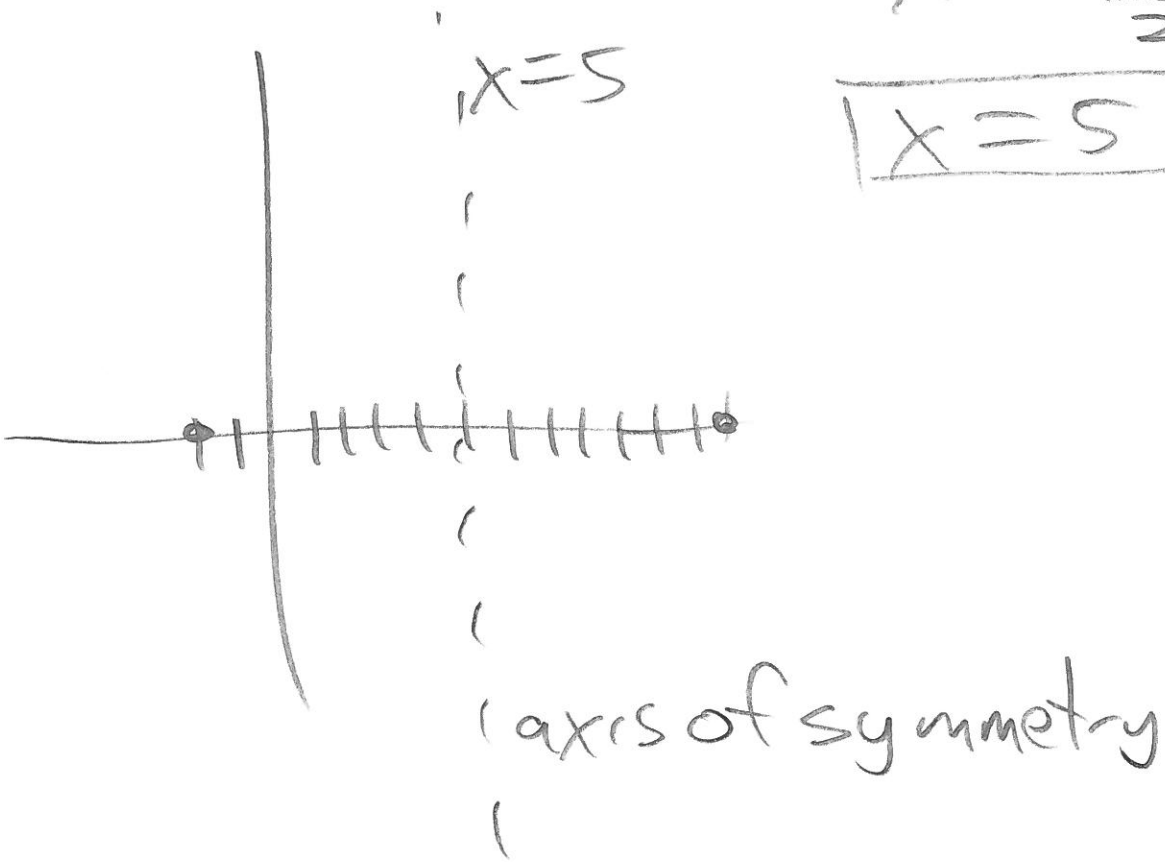
(4) <u>Given</u> x intercepts of Parabola (12,0) (-2,0)

<u>want</u> axis of symmetry

$$x = \frac{x\text{int} + x\text{int}}{2} \rightarrow x = \frac{12 + -2}{2}$$

$$x = \frac{10}{2}$$

$$\boxed{x = 5}$$



Parts of Parabola

(5) $y = 12 - 3x^2 - 10x$

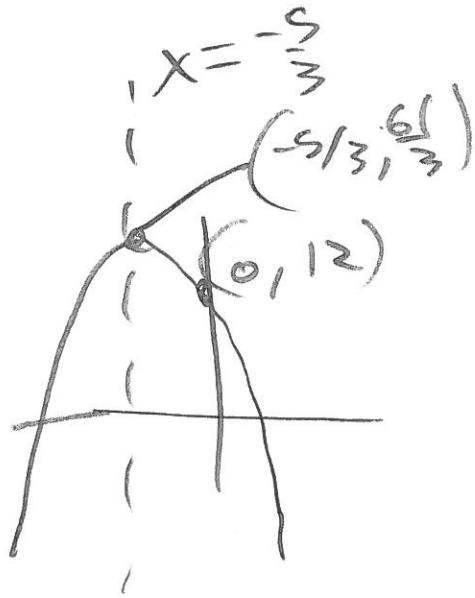
(A) Find standard form

$y = -3x^2 - 10x + 12$

opens Down

$a < 0$

yint $(0, 12)$



$a = -3 \quad b = -10 \quad c = 12$ → yint

$x = \frac{-b}{2a}$ → vertex "x"

→ axis of symmetry

$$\boxed{x = \frac{10}{-6} = -\frac{5}{3}}$$

axis of symmetry

$y = -3x^2 - 10x + 12$

$= -3\left(\frac{-5}{3}\right)^2 - 10\left(\frac{-5}{3}\right) + 12$

$\boxed{y = 20.\overline{3}}$

Vertex

$\left(\frac{-5}{3}, \frac{61}{3}\right) \approx (-1.67, 20.33)$

⑥ Rewrite $-3x^2-7x=8x^2-2$ with positive lead coefficient (this means $a>0$)

$$-3x^2-7x=8x^2-2$$
$$+3x^2 \qquad\qquad +3x^2$$

$$-7x=11x^2-2$$

$$-7x=11x^2-2$$
$$+7x \qquad\qquad +7x$$

$$\boxed{0=11x^2+7x-2}$$

$$\boxed{\begin{aligned} a&=11\\ b&=7\\ c&=-2 \end{aligned}}$$

$$D=(7)^2-4(11)(-2)$$

$$\boxed{D=137}$$

$$\boxed{D>0 \text{ 2 real solutions}}$$

(7) simplify $\sqrt{-32}$

$\sqrt{-4}\sqrt{8}$

$2i\sqrt{8}$ not completely simplified

$2i\sqrt{4}\sqrt{2}$

$2i \cdot 2\sqrt{2}$

$\boxed{4i\sqrt{2}}$ completely simplified

OR $\sqrt{-16}\sqrt{2}$

$\boxed{4i\sqrt{2}}$ → completely simplified

(8) Simplify $\dfrac{-12 \pm \sqrt{-24}}{6}$

$$\frac{-12 \pm \sqrt{-4}\sqrt{6}}{6} = \frac{-12 \pm 2i\sqrt{6}}{6}$$

since -12, 2, & 6 are $\div$ by 2

$$\frac{-6 \cdot 2 \pm 2i\sqrt{6}}{3 \cdot 2} \Rightarrow \boxed{\frac{-6 \pm i\sqrt{6}}{3}}$$

(9) Simplify $\dfrac{8 \pm 4\sqrt{5}}{10}$

since 8, 4, 10 are all $\div$ by 2

$$\frac{4 \cdot 2 \pm 2 \cdot 2\sqrt{5}}{2 \cdot 5} \Rightarrow \boxed{\frac{4 \pm 2\sqrt{5}}{5}}$$

Role of the discriminant

10. If you have _____, then your quadratic equation will have 1 real solution
    a. D = 0
    b. D > 0
    c. D < 0

11. If you have _____, then your quadratic equation will have 2 real solutions
    a. D = 0
    b. D > 0
    c. D < 0

12. If you have _____, then your quadratic equation will have no real solutions
    a. D = 0
    b. D > 0
    c. D < 0

13. If you have _____, then your quadratic equation will have 2 imaginary solutions
    a. D = 0
    b. D > 0
    c. D < 0

14. If your parabola "bounces" off the x axis, then you have _____
    a. D = 0
    b. D > 0
    c. D < 0

15. If your parabola crosses the x axis in two places , then you have _____
    a. D = 0
    b. D > 0
    c. D < 0

16. If your parabola NEVER crosses the x axis, then you have _____
    a. D = 0
    b. D > 0
    c. D < 0

17. Which of the following discriminants comes from a factorable quadratic equation?
    a. D =12
    b. D =-25
    c. D =17
    d. D = 49 → perfect square

18. Which of the following discriminants comes from a factorable quadratic equation?
    a. D =12
    b. D =-25
    c. D =0 → 0 PST or multipl.
    d. D = -64

Imaginary numbers

19. Which of the following is written in complex number form? a. 5i +6 b. 6 + 5i(5-i) c. -2 +6i d. $-2-7i^2$	20. Simplify i^{14} $i^{14} = i^{12} i^2 = 1 \cdot i^2$ $\boxed{i^{14} = -1}$ $i^2 = -1$ $4 \overline{)14}$ = 3 r 2	21. Simplify i^{45} $4 \overline{)45}$ = 11 r 1 $i^{45} = i^1 = i$
22. Simplify (6 - 2i)(5+4i) $30 - 10i + 24i - 8i^2$ $30 + 14i - 8i^2$ $30 + 14i - 8(-1)$ $30 + 14i + 8$ $\boxed{38 + 14i}$	23. (6 - 2i)+(5+4i) $6 - 2i + 5 + 4i$ $\boxed{11 + 2i}$	24. (6 - 2i)-(5+4i) $6 - 2i - 1(5+4i)$ $6 - 2i - 5 - 4i$ $\boxed{1 - 6i}$

(25) Simplify $\frac{5}{7+3i}$

$7+3i$ has conjugate $7-3i$

$$\frac{5}{7+3i}\frac{(7-3i)}{(7-3i)} = \frac{35-15i}{49+21i-21i-9i^2}$$

$$= \frac{35-15i}{49-9i^2} = \frac{35-15i}{49-9(-1)}$$

$$= \frac{35-15i}{49+9} = \frac{35-15i}{58}$$

now split into $a+bi$

$$\boxed{\frac{35}{58} - \frac{15}{58}i}$$

(26)

$$\boxed{\begin{aligned} i^1 &= i \\ i^2 &= -1 \\ i^3 &= -1i \\ i^4 &= 1 \end{aligned}}$$

first four powers of i

(27) $(6-2i)(6+2i)$

Note these are conjugates

$36 - 12i + 12i - 4i^2$

$36 - 4i^2 = 36 - 4(-1)$

$= 36 + 4$

$= \boxed{40}$

always just # when multiplying conjugates

(28) Find absolute value of

$|-2+7i|$

$a = -2$

$b = 7$

$|-2+7i| = \sqrt{a^2+b^2}$

Note $a^2+b^2 = (-2)^2+(7)^2 =$

$= 53$

So $\boxed{|-2+7i| = \sqrt{53}}$

(29) State conjugate of $9+5i$

$\boxed{9-5i}$

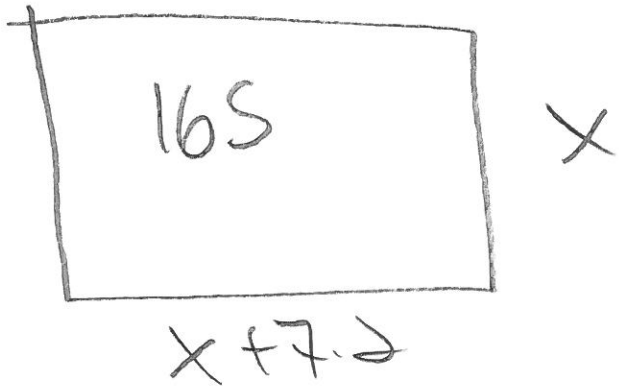
(30) State conjugate of $3i-9$

Note need $a+bi$ 1st

So $3i-9 \rightarrow -9+3i$

$\boxed{\text{Conjugate } -9-3i}$

(31) Given



$a=1$
$b=7.2$
$c=-165$

$A = LW$

$A = (x+7.2)(x)$

$A = x^2+7.2x$

$165 = x^2+7.2x$

Get standard form

$x^2+7.2x = 165$
$\quad -165 \quad -165$

$\boxed{x^2+7.2x-165=0}$

$\boxed{D=(7.2)^2-4(1)(-165) = 711.84}$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-7.2 \pm \sqrt{711.84}}{2}$$

$$x = \frac{-7.2+\sqrt{711.84}}{2}$$

$$\boxed{x \approx \frac{19.48032983}{2} \approx 9.7}$$

$x+7.2$
$= 7.6+9.7$

$\boxed{x+7.2 \approx 17.3}$

✓✓ $(9.7)(17.3) \approx 167.81$