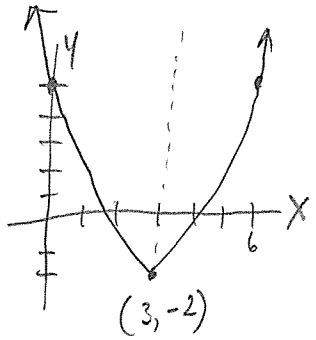
Connections in Chapter 3

① 

② a) $y = 2x^2 - 4x - 1$

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

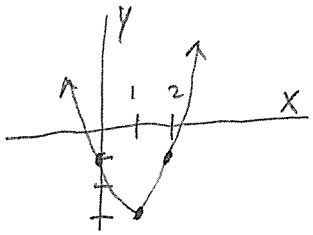
$y + 1 + 2 = 2(x^2 - 2x + 1)$

$y = 2(x-1)^2 - 3$

vertex $(1, -3)$

y-int $= -1$

sym pt $= (2, -1)$



b) $y = -x^2 - 10x - 29$

$y + 29 = -1(x^2 + 10x)$

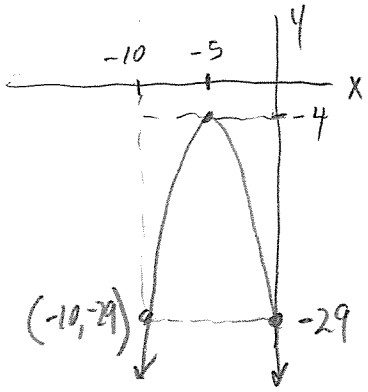
$y + 29 - 25 = -1(x^2 + 10x + 25)$

$y = -1(x+5)^2 - 4$

vertex $(-5, -4)$

y-int $(0, -29)$

sym pt $(-10, -29)$



③ a) $a=1, b=3, c=-8$

$x = \dfrac{-3 \pm \sqrt{9 - 4(-8)}}{2}$

$x = \dfrac{-3}{2} \pm \dfrac{\sqrt{41}}{2}$

b) $3x^2 - 5x - 7 = 0$

$x = \dfrac{5 \pm \sqrt{25 - 4(3)(-7)}}{6}$

$x = \dfrac{5}{6} \pm \dfrac{\sqrt{109}}{6}$

c) $x = \dfrac{-4 \pm \sqrt{16 - 4(24)}}{2}$

$= -2 \pm \dfrac{\sqrt{-80}}{2}$

$= -2 \pm \dfrac{4i\sqrt{5}}{2}$

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

d) $9x^2 + 6x + 2 = 0$

$x = \dfrac{-6 \pm \sqrt{36 - 4(18)}}{18}$

$= -\dfrac{1}{3} \pm \dfrac{\sqrt{-36}}{18}$

$x = -\dfrac{1}{3} \pm \dfrac{1}{3}i$

④ a) $6x^2 + 2x - 5 = 0$

$b^2 - 4ac =$ discrim.

$4 - 4(6)(-5) =$

$124 =$ discrim.

2 real irrational roots

b) $12x^2 + 2x + 5 = 0$

$4 - 4(12)(5) =$ disc.

$-236 =$ disc.

2 complex sol'ns

⑤ a) vertex: $(1, -8)$

$x = \dfrac{6}{2(3)} = 1$

$y = 3 - 6 - 5$

$= -8$

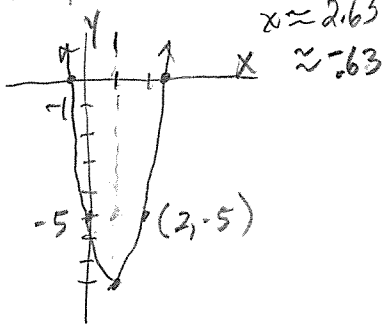
y-int $(0, -5)$

sym pt $(2, -5)$

x-int $= \dfrac{6 \pm \sqrt{96}}{6} \to 1 \pm \dfrac{2\sqrt{6}}{3}$

$x \simeq 2.63$

$\simeq -.63$



b) $y = \frac{1}{2}x^2 - 4x + 14$

vertex $= (4, 6)$

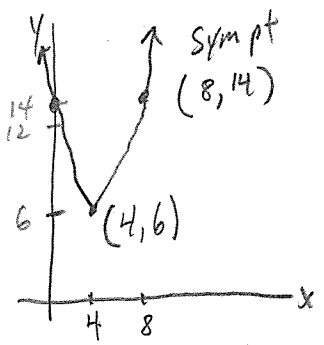
$x = \dfrac{4}{2(\frac{1}{2})} = 4$

$y = 8 - 16 + 14 \Rightarrow 6$

y-int $(0, 14)$

$x = \dfrac{4 \pm \sqrt{16 - 4(\frac{1}{2})(14)}}{2(\frac{1}{2})}$

$= 4 \pm \sqrt{-12} \Rightarrow 4 \pm 2i\sqrt{3}$



⑥ $f(x) = -3x^2 + 6x - 4$

a) $f(-3) = -3(9) - 18 - 4$

$f(-3) = -49$

b) $f(4) = -3(16) + 24 - 4$

$f(4) = -28$

c) Try factoring - doesn't work

$x = \frac{-6 \pm \sqrt{36 - 4(-3)(-4)}}{2(-3)}$

$= 1 \pm \frac{\sqrt{-12}}{-6}$

$= 1 \pm \frac{2i\sqrt{3}}{-6}$

$x = 1 \pm \frac{1i\sqrt{3}}{3}$

d) $(0, -4)$

e) $-3x^2 + 6x - 4 = -2$

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

$x = \frac{-6 \pm \sqrt{36 - 4(-3)(-2)}}{2(-3)}$

$= \frac{-6 \pm \sqrt{12}}{-6}$

$x = 1 \pm \frac{1}{3}\sqrt{3}$

⑦ $2x^2 - 3x + 1 = 4$

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

$x = \frac{3 \pm \sqrt{9 - 4(2)(-3)}}{2(2)}$

$x = \frac{3}{4} \pm \frac{\sqrt{33}}{4}$

⑧ a) $2x^2 - 8x + 12 = 7$

$2x^2 - 8x + 5 = 0$

$64 - 4(2)(5) = \text{disc.}$

$64 - 40 =$

$24 = \text{disc.}$

↳ yes, $f(x)$ will equal 7.

b) $-3x^2 + 8x - 15 = 12$

$64 - 4(-3)(-27) = \text{disc.}$

$-260 = \text{disc.}$

↳ No, $f(x) \neq 12$

⑩ ⓐ $a_1 + a_2$:

$2 + 3i + 1 - 5i \rightarrow 3 - 2i$

$a_1 - a_2$:

$2 + 3i - (1 - 5i) \rightarrow 2 + 3i - 1 + 5i$

$1 + 8i$

$(a_1)(a_2)$: $(2 + 3i)(1 - 5i) \Rightarrow 2 - 7i - 15i^2$

$\Rightarrow 17 - 7i$

$\frac{a_1}{a_2}$: $\frac{(2+3i)}{(1-5i)} \cdot \frac{(1+5i)}{(1+5i)} = \frac{2 + 13i + 15i^2}{1 + 25}$

$= \frac{-13 + 13i}{26} \Rightarrow -\frac{1}{2} + \frac{1}{2}i$

ⓑ $a_1 + a_2$: $3i$

$a_1 - a_2$: $3 + i + 3 - 2i \Rightarrow 6 - i$

$(a_1)(a_2)$: $(3 + i)(-3 + 2i) \Rightarrow -9 + 3i + 2i^2$

$\Rightarrow -11 + 3i$

$\frac{a_1}{a_2}$: $\frac{(3+i)}{(-3+2i)} \cdot \frac{(-3-2i)}{(-3-2i)} \Rightarrow \frac{-9 - 3i - 6i - 2i^2}{9 + 4}$

$\Rightarrow \frac{-7 - 9i}{13} \rightarrow -\frac{7}{13} - \frac{9i}{13}$

⑪ a) $i^{271} \Rightarrow i^3 \Rightarrow -i$ b) $\frac{1}{i^{65}} \Rightarrow \frac{1}{i} \cdot \frac{i}{i} = -i$ c) $i\sqrt{16 \cdot 3}$

$4i\sqrt{3}$

d) $(\sqrt{-20})(\sqrt{-24}) \Rightarrow 2i\sqrt{5} \cdot 2i\sqrt{6}$

$-4\sqrt{30}$