College Algebra — Joysheet 8
MAT 140, Spring 2021 — D. Ivanšić

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Covers: 3.1, 3.2, 3.3 Show all your work!

Simplify, so that the answer is in form $a+bi$.

1. (4pts) $(3-4i)i+(2i)^2 = 3i-4i^2+4i^2 = 3i$

2. (6pts) $\frac{7-2i}{2+i} = \frac{7-2i}{2+i}\cdot\frac{2-i}{2-i} = \frac{14-7i-4i+2i^2}{2^2-i^2} = \frac{12-11i}{4-(-1)} = \frac{12-11i}{5}$

3. (4pts) Simplify and justify your answer.

$i^{146} = i^{144}\cdot i^2 = \underbrace{(i^4)^{36}}_{=1}\cdot i^2 = 1\cdot(-1) = -1$

4. (8pts) The number of smartphones in storage of an electronics store is described by the function $S(x) = 0.5x^2 - 14x + 428$, where x is the number of days after 20th. November
a) On what dates did the store have 348 smartphones in storage?
b) On what date did the number of smartphones in storage bottom out?

a) $0,5x^2-14x+428 = 348$

$0,5x^2-14x+80 = 0$ $196-160$

$x = \frac{-(-14)\pm\sqrt{(-14)^2-4\cdot 0,5\cdot 80}}{\underbrace{2\cdot 0,5}_{=1}}$

$= 14\pm 6 = 20, 8$ days aftr 11/20

So: Nov 28, Dec 10th

b) $-\frac{b}{2a} = -\frac{-14}{2\cdot 0,5} = 14$ days aftr 11/20

so Dec 4th

5. (8pts) Solve the equation: $x^6+4x^3-21=0$

$(x^3)^2+4x^3-21=0$

$u=x^3$

$u^2+4u-21=0$

$(u+7)(u-3)=0$

$u=-7, 3$

$x^3=-7$ $x^3=3$

$x=\sqrt[3]{-7}$ $x=\sqrt[3]{3}$

6. (6pts) Solve by completing the square.

$x^2+14x+60=0$ $\quad|+7^2$

$x^2+2\cdot x\cdot 7+7^2+60=7^2$

$(x+7)^2 = 49-60$

$(x+7)^2=-11$

$x+7=\pm\sqrt{11}\,i$

$x=-7\pm\sqrt{11}\,i$

7. (12pts) The quadratic function $f(x) = -x^2 + 9x - 18$ is given. Do the following without using the calculator.

a) Find the x-intercepts of its graph, if any. Find the y-intercept.

b) Find the vertex of the graph.

c) Sketch the graph of the function.

a) x-int:

$-x^2+9x-18=0$

$x^2-9x+18=0$

$(x-3)(x-6)=0$

$x=3, 6$

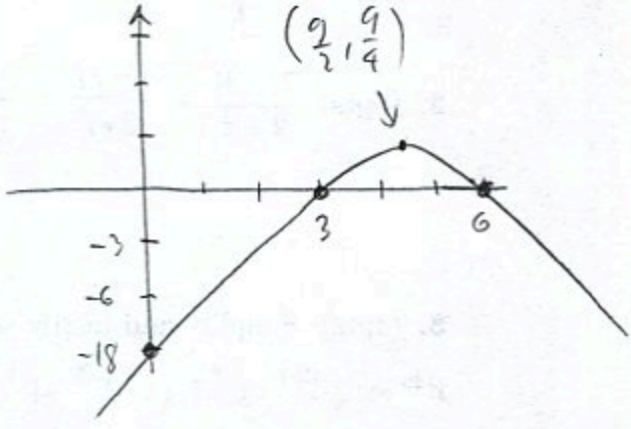
y-int: $f(0)=-18$

b) $h=-\frac{b}{2a}=-\frac{9}{2\cdot(-1)}=\frac{9}{2}$

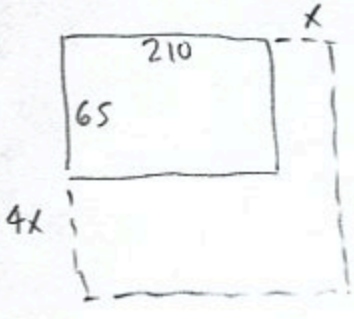
$k=-\left(\frac{9}{2}\right)^2+\frac{9\cdot 9}{2}-18$

$=-\frac{81}{4}+\frac{81}{2}-18$

$=\frac{81}{4}-18=\frac{81-72}{4}=\frac{9}{4}$



8. (12pts) Jeff's house sits on a big rectangular plot of land that is 210 by 65 meters. He wishes to enlarge it to get a rectangular plot with area 18,000 square meters by extending the 210-meter side by a certain amount and extending the 65-meter side by four times that amount. By how much should the 210- and 65-meter sides be extended to achieve the desired area?



Area of new rectangle $= 18{,}000$

$(65+4x)(210+x)=18{,}000$

$4x^2+840x+65x+13650=18{,}000$

$4x^2+905x-4350=0$

$x=\frac{-905\pm\sqrt{905^2-4\cdot 4\cdot(-4350)}}{2\cdot 4}=\frac{-905\pm\sqrt{888625}}{8}$

$=\frac{-905\pm 942.669083}{8}=4.708635$ and a negative number cannot be solution since $x>0$,