M3 Unit 2B Review Sheet

20/10/2

① $5x^2+12x+4=0$

$(5x+10)(5x+2)=0$ (5)

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

$x=-2$ $5x=-2$

$x=-2/5$

② $4x^2=20x$

$4x^2-20x=0$

$4x(x-5)=0$

$4x=0$ $x-5=0$

$x=0$ $x=5$

③ $x^2-5x=50$

$x^2-5x-50=0$

$(x-10)(x+5)=0$

$x=10$ $x=-5$

④ $5r^2=15r$

$5r^2-15r=0$

$5r(r-3)=0$

$5r=0$ $r-3=0$

$r=0$ $r=3$

⑤ $4x^2-9=0$ ★Difference of Perfect □s

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

$2x=3$ $2x=-3$

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

⑥ $d^2-6d=7$

$d^2-6d-7=0$

$(d-7)(d+1)=0$

$d=7$ $d=-1$

⑦ $x^2-6x+9=0$

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

$x=3$ $x=3$

★$x=3$ (multiplicity 2)

⑧ $5x^3-125x=0$

$5x(x^2-25)=0$

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

$5x=0$ $x-5=0$ $x+5=0$

$x=0$ $x=5$ $x=-5$

⑨ $15x^2=35x-10$

$15x^2-35x+10=0$

$5(3x^2-7x+2)=0$

$5(3x-1)(x-2)=0$

~~$5=0$~~ $3x-1=0$ $x-2=0$

$3x=1$ $x=2$

$x=1/3$

⑩ $x^2+6x+10=0$

$x^2+6x=-10$

$x^2+6x+\frac{9}{\ }=-10+\frac{9}{\ }$

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

$x+3=\pm\sqrt{-1}$

$x+3=\pm i$

$x=-3\pm i$

⑪ $x^2-3x=8$

$x^2-3x+\frac{9/4}{\ }=8+\frac{9/4}{\ }$

$(x-3/2)^2=41/4$

$x-3/2=\pm\sqrt{41/4}$

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

$x=\frac{3}{2}+\frac{\sqrt{41}}{2}$ ★OR $x=\frac{3\pm\sqrt{41}}{2}$

⑫ $2x^2+5x-4=0$ ★must ÷ every thing by 2

$x^2+\frac{5}{2}x-2=0$

$x^2+\frac{5}{2x}+\frac{25/16}{\ }=2+\frac{25/16}{\ }$

$(x+5/4)^2=57/16$

$x+5/4=\pm\sqrt{57/16}$

$x=\frac{-5}{4}+\frac{\sqrt{57}}{4}$ ★OR $x=\frac{-5\pm\sqrt{5}}{4}$

⑬ $x^2+8x+16$

Discriminant → b^2-4ac

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

0 one real rational root

⑭ x^2-2x+7

$(-2)^2-4(1)(7)$

-24 two imaginary roots

⑮ $x^2+9x+20=0$

$x=\frac{-9\pm\sqrt{(9)^2-4(1)(20)}}{2(1)}$

$x=\frac{-9\pm\sqrt{1}}{2}$

$x=\frac{-9\pm1}{2}$ ★keep going!

$x=\frac{-9+1}{2}$ $x=\frac{-9-1}{2}$

$x=-4$ $x=-5$

⑯ $4x^2-3x-2=0$

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

$x=\frac{3\pm\sqrt{41}}{8}$

(17) $x^2+16=0$

$x^2=-16$

$x=\pm\sqrt{-16}$

$x=\pm 4i$

or

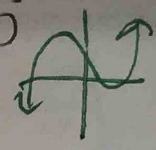
(18) $5x^2=40$

$x^2=8$

$x=\pm\sqrt{8}$

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

(19) $f(x)=2x^3-x^2-40x+75$



calc table: (-5,0) (3,0)

-5	2	-1	-40	75
+	↓	-10	55	-75
	2	-11	15	0

3	2	-11	15
+	↓	6	-15
	2	-5	0 Rem

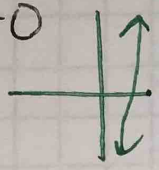
$2x-5=0$

$2x=5$

$x=5/2$

Roots: $x=-5, 3, 5/2$

(20) $f(x)=x^3-10x^2+34x-40$



calc table: (4,0)

4	1	-10	34	-40
+	↓	4	-24	40
	1	-6	10	0

$x^2-6x+10=0$

$x^2-6x+9=-10+9$

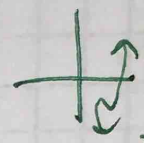
$(x-3)^2=-1$

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

$x=3\pm i$

Roots: $x=4, 3\pm i$

(21) $f(x)=x^3-7x^2+17x-15$



calc table: (3,0)

3	1	-7	17	-15
+	↓	3	-12	15
	1	-4	5	0

$x^2-4x+5=0$

$x^2-4x+4=-5+4$

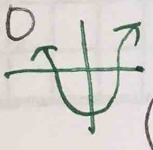
$(x-2)^2=-1$

$x-2=\pm\sqrt{-1}$

$x=2\pm i$

Roots: $x=3, 2\pm i$

(22) $f(x)=x^4-6x^3+6x^2+24x-40$



calc table: (2,0) (-2,0)

2	1	-6	6	24	-40
+	↓	2	-8	-4	40
	1	-4	-2	20	0

-2	1	-4	-2	20
+	↓	-2	12	-20
	1	-6	10	0

$x^2-6x+10=0$

$x=\dfrac{6\pm\sqrt{(-6)^2-4(1)(10)}}{2(1)}$

$x=\dfrac{6\pm\sqrt{-4}}{2}$

$x=\dfrac{6\pm 2i}{2}$

reduce!

$x=3\pm i$

(23) Roots: $6, 2i$ $-2i$ is also a root

$(x-6)$

sum: $2i-2i=0$

prod: $2i\cdot -2i=-4i^2=4$

$(x-6)(x^2+4)$

$y=x^3-6x^2+4x-24$

(24) Roots: $4, -1, -3i$ $3i$ is also a root

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

sum: $-3i+3i=0$

prod: $-3i\cdot 3i=-9i^2=9$

$(x-4)(x+1)(x^2+9)$

$(x^2-3x-4)(x^2+9)$

	x^2	9
x^2	x^4	$9x^2$
$-3x$	$-3x^3$	$-27x$
-4	$-4x^2$	-36

$y=x^4-3x^3+5x^2-27x-36$

(25) Roots: $2, -\sqrt{3}$ $\sqrt{3}$ is also a root

$(x-2)$

sum: $-\sqrt{3}+\sqrt{3}=0$

prod: $-\sqrt{3}\cdot\sqrt{3}=-3$

$(x-2)(x^2-3)$

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

(26) Roots: $1+2i$, $1-i$, $1-2i$, $1+i$

sum: $1+2i+1-2i=2$

prod: $(1+2i)(1-2i)=1-4i^2=5$

(x^2-2x+5)

sum: $1-i+1+i=2$

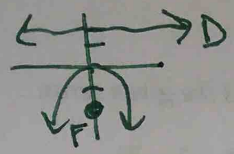
prod: $(1-i)(1+i)=1-i^2=2$

(x^2-2x+2)

	x^2	$-2x$	2
x^2	x^4	$-2x^3$	$2x^2$
$-2x$	$-2x^3$	$4x^2$	$-4x$
5	$5x^2$	$-10x$	10

$y=x^4-4x^3+11x^2-14x+10$

(27) $y = -\frac{1}{8}x^2$



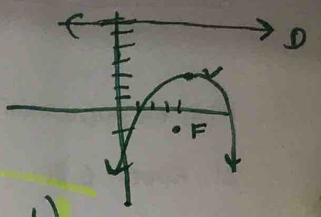
opens down

Vertex: (0,0) Focus: (0,-2)

$c = \left|\frac{1}{4(-1/8)}\right|$ Dir: $y = 2$

$c = 2$

(28) $y = \frac{-1}{16}(x-4)^2 + 3$



opens down

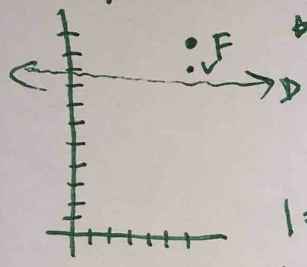
Vertex: (4,3) Focus: (4,-1)

$c = \left|\frac{1}{4(-1/16)}\right|$ Dir: $y = 7$

$c = 4$

(29) Focus (6,11) Dir $y = 9$

★Sketch it!



★vertex is halfway between F&D

Vertex: (6,10)

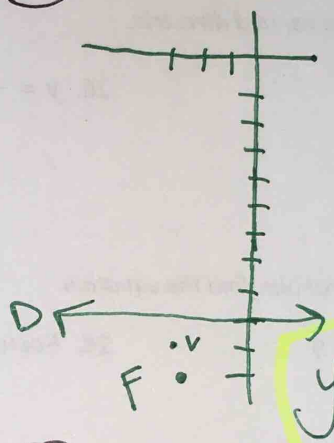
$1 = \left|\frac{1}{4a}\right|$

$4a = 1$

$a = 1/4$ ← keep it positive b/c it opens up

$y = \frac{1}{4}(x-6)^2 + 10$

(30) Focus (-3,-11) Dir $y = -9$



Vertex: (-3,-10)

$1 = \left|\frac{1}{4a}\right|$

$4a = 1$

$a = 1/4$ ← ★make it negative b/c it opens down!

$y = -\frac{1}{4}(x+3)^2 - 10$

(31) (a) initial height means time hasn't started yet so $x = 0$

look at table → (0,0)

initial height is 0 feet (ball starts on the ground)

(b) height after 2 seconds

look at table when $x = 2$

192 feet

(c) maximum height

use 2nd, trace, maximum

(4,256) "y" represents height

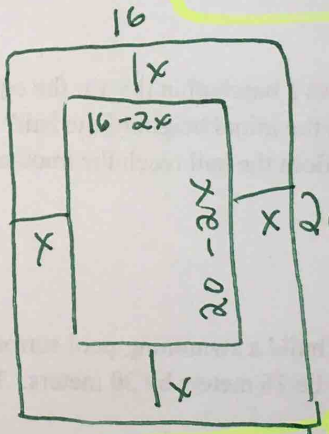
so max height is 256 feet

(d) after 4 seconds

(e) use 2nd, trace, zero → (0,0)

after 8 seconds

(32)



Area of pool = 192

$(16-2x)(20-2x) = 192$

$(16-2x)(20-2x) - 192 = 0$

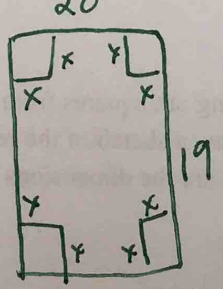
★graph in calc★

look for $y = 0$ in the table

$x = 2$

the sidewalk should be 2 meters

(33)



$V = l \cdot w \cdot h$

$V = (10-2x)(19-2x)(x)$

★Graph in calc★

use 2nd, trace, maximum

(2.09, 180.27)

↑ max volume

$x \approx 2$

Dimensions: 2 × 6 × 15