# U3 Review

1. a) $2\sqrt{50}$
$= 2(5)\sqrt{2}$
$= 10\sqrt{2}$

b) $\frac{2}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}}$
$= \frac{\cancel{2}(2)\sqrt{2}}{\cancel{8}\cancel{4}2}$
$= \frac{\sqrt{2}}{2}$

c) $\frac{\sqrt{10}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$
$= \frac{\sqrt{60}}{6}$
$= \frac{\overset{1}{\cancel{2}}\sqrt{15}}{\cancel{6}3}$
$= \frac{\sqrt{15}}{3}$

d) $\sqrt{-50}$
$= 5i\sqrt{2}$

e) $(2-3i)(1+2i)$
$= 2+i-6i^2$
$= 2+i-6(-1)$
$= 8+i$

f) $i^5$
$= i^2 \cdot i^2 \cdot i$
$= (-1)(-1) \cdot i$
$= i$

g) $\frac{3-\sqrt{2}}{5+2\sqrt{2}} \times \frac{5-2\sqrt{2}}{5-2\sqrt{2}}$
$= \frac{15-6\sqrt{2}-5\sqrt{2}+2(2)}{25-4(2)}$
$= \frac{19-11\sqrt{2}}{17}$

2. a) $x^2-2x+50=0$
$x = \frac{2 \pm \sqrt{4-200}}{2}$
$= \frac{2 \pm \sqrt{-196}}{2}$
$= \frac{2 \pm 14i}{2}$
$= 1 \pm 7i$

b) $x^2+4=-6$
$x^2+6x+4=0$
$x = \frac{-6 \pm \sqrt{36-16}}{2}$
$= \frac{-6 \pm \sqrt{20}}{2}$
$= \frac{-6 \pm 2\sqrt{5}}{2}$
$= -3 \pm \sqrt{5}$

Text pp 202-203 5, 9, 11-18, 21, 23

5. $h(t) = -4.9t^2+28t+2$
$= -4.9\left[t^2 - \frac{28}{4.9}t + \left(\frac{28}{9.8}\right)^2 - \left(\frac{28}{9.8}\right)^2\right] + 2$
$= -4.9\left(t-\frac{28}{9.8}\right)^2 + 40 + 2$
$= -4.9(t-2.857)^2 + 42$

$\therefore$ The max height of 42 m is reached at approx 2.9 s.

p. 202

9. a) $\sqrt{98}$ b) $-5\sqrt{32}$ c) $4\sqrt{12}-3\sqrt{48}$ d) $(3-2\sqrt{7})^2$

$=7\sqrt{2}$

$=-20\sqrt{2}$

$=8\sqrt{3}-12\sqrt{3}$

$=-4\sqrt{3}$

$=9-12\sqrt{7}+28$

$=37-12\sqrt{7}$

11.

Let c rep. the hypotenuse

(i) $a^2+b^2=c^2$

$6^2+3^2=c^2$

$36+9=c^2$

$c=\sqrt{45}$

$c=3\sqrt{5}\text{cm}$

(ii) $P=S_1+S_2+S_3$

$=6+3+3\sqrt{5}$

$=(9+3\sqrt{5})\text{cm}$

12. $f(x) = 2x^2+x-15$

x-int, $f(x)=0$

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

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

$\therefore x=\frac{5}{2}$ or $-3$

13a) $P(13)=12(13)^2+800(13)+40000$

$=2028+10400+40000$

$=52428$

RW

$t=2020-2007$

$=13$

∴ In 2020 the pop$^n$ of the city will be 52428 people.

b) sub $P(t)=300\,000$

$300\,000=12t^2+800t+40\,000$

$0=12t^2+800t-260\,000$

$0=4(3t^2+200t-65000)$

$t=\frac{-200\pm\sqrt{40000+780000}}{6}$

$=\frac{-200\pm\sqrt{820000}}{6}$

inadmissible

$\doteq 117.59$ or $-\cancel{184.26}$

Text says 2124 →

∴ The pop$^n$ will be 300 000 in the year 2007 + 117.59 = 2124.59 which is actually more than halfway through 2125.

p202

14. $P=400m$

$A= 8000m^2$

$2l+2w=400$

$2l = 400-2w$

$\boxed{l = 200-w}$

Let w and 200-w rep. the width and length, resp.

$$lw = A$$
$$(200-w)w=8000$$
$$-w^2+200w-8000=0$$
$$w^2-200w+8000=0$$
$$w = \frac{200 \pm \sqrt{40000 - 4(8000)}}{2}$$
$$= \frac{200 \pm \sqrt{8000}}{2}$$
$$= \frac{200 \pm 40\sqrt{5}}{2}$$
$$= 100 \pm 20\sqrt{5}$$
$$\doteq \cancel{144.72} \text{ or } 55.28$$

inadmissible

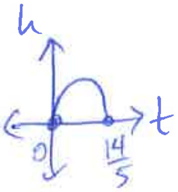
∴ The dimensions are 55.28 m by 200-55.28 or 144.72 m.

15. $h(t)=14t-5t^2$

t-int, $h(t)=0$

$0=-t(5t-14)$

∴ $t=0$ and $\frac{14}{5}$ or 2.8



Max height is at $t=1.4$ s.

$$h(1.4)=14(1.4)-5(1.4)^2$$
$$= 19.6 - 9.8$$
$$= 9.8$$

∴ max height is 9.8m

∴ the projectile definitely reaches a height of 9m.

set $h(t)=9$

$0=-5t^2+14t-9$

$\boxed{\text{OR}}$ $D=b^2-4ac$

$= (14)^2-4(-5)(-9)$

$= 196-180$

$= 16$

∴ 2 roots and parabola opens down so it is above the t-axis.

17. for the break-even pt. $\underline{P(x)=0}$

$$0=-2x^2+7x+8$$

$$x=\frac{-7\pm\sqrt{49+64}}{-4}$$

$$=\frac{-7\pm\sqrt{113}}{-4}$$

$\doteq -0.9075$ or $4.4075$ in thousands

$\therefore$ Approx 4408 dirt bikes must be sold.

18. $x=2\pm\sqrt{3}$

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

$$x^2-4x+4=3$$

$$x^2-4x+1=0$$

$$\therefore f(x)=a(x^2-4x+1)$$

$\underline{\text{sub}(2,5)}$

$$5=a(2^2-4(2)+1)$$

$$5=-3a$$

$$a=-\frac{5}{3}$$

$$\therefore f(x)=-\frac{5}{3}(x^2-4x+1)$$

$$=-\frac{5}{3}x^2+\frac{20}{3}x-\frac{5}{3}$$

p. 203

21. ① $f(x) = 2x^2+4x-11$, ② $g(x) = -3x+4$

① = ②

$2x^2+4x-11 = -3x+4$

$2x^2+7x-15=0$

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

$x = \frac{3}{2}$ and $x=-5$

$g(\frac{3}{2}) = -3(\frac{3}{2})+4$

$= -\frac{9}{2}+\frac{8}{2}$

$= -\frac{1}{2}$

$g(-5) = -3(-5)+4$

$= 15+4$

$= 19$

∴ the PoI's are $(\frac{3}{2}, -\frac{1}{2})$ and $(-5, 19)$

23. a) ① $f(x) = x^2-6x+9$ ② $g(x) = -3x-5$

① = ②

$x^2-6x+9 = -3x-5$

$x^2-3x+14=0$

$D = 9-4(14)$

$= 9-56$

$= -47$

∵ $D<0$

∴ no PoI's

b) To intersect in 2 places $D>0$. Changing $g(x)$ to have a slope of $\geq 2$.

eg. $x^2-6x+9 = 2x-5$

$x^2-8x+14=0$

$D = 64-56$

$= 8$

∴ 2 $sol^{ns}$.

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p. 204

1. a) $f(x) = -5x^2+10x-5$

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

$= -5(x-1)^2$

b) one zero, vertex at (1,0); axis of symm $x=1$ and opens down

c) D: $\{x \in R\}$

R: $\{y \in R \mid y \leq 0\}$

2. a) max value; CTS

2. b) min value; average the zeros

6 a) $(2-\sqrt{8})(3+\sqrt{2})$

$= 6+2\sqrt{2}-3\sqrt{8}-\sqrt{16}$

$= 6+2\sqrt{2}-6\sqrt{2}-4$

$= 2-4\sqrt{2}$

6. b) $(3+\sqrt{5})(5-\sqrt{10})$

$= 15-3\sqrt{10}+5\sqrt{5}-\sqrt{50}$

$= 15-3\sqrt{10}+5\sqrt{5}-5\sqrt{2}$

7. $Kx^2-4x+K=0$ (one root)

$D = 16-4K^2$

∵ one root

∴ $D=0$

and $16-4K^2=0$

$K^2=4$

$K=\pm 2$

8. (i) ① $g(x)=6x-5$ ② $f(x)=2x^2-3x+2$

$$①=②$$
$$6x-5=2x^2-3x+2$$
$$0=2x^2-9x+7$$

$$D=81-56$$
$$=25$$

$\because D>0$

$\therefore$ 2 $sol^{ns}$

(ii) $x=\frac{9\pm\sqrt{D}}{4}$

$$=\frac{9\pm\sqrt{25}}{4}$$
$$=\frac{9\pm5}{4}$$
$$=\frac{7}{2} \text{ or } 1$$

$$g\left(\frac{7}{2}\right)=\overset{3}{\cancel{6}}\left(\frac{7}{\underset{1}{\cancel{2}}}\right)-5$$
$$=21-5$$
$$=16$$

$$g(1)=6(1)-5$$
$$=1$$

$\therefore$ POI's are $\left(\frac{7}{2},16\right)$ and $(1,1)$

9. From graph V: (4,3) and pt. (3,2)

$$y=a(x-4)^2+3$$

sub (3,2)

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

$\therefore$ $y=-(x-4)^2+3$ in vertex form

or $y=-(x^2-8x+16)+3$

$=-x^2+8x-13$ in standard form

p178

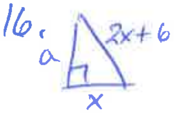
13. a) set $h(t)=150$

$$150=-4.9t^2+92t+9$$
$$0=-4.9t^2+92t-141$$
$$t=\frac{-92\pm\sqrt{8464-2763.6}}{-9.8}$$
$$=\frac{-92\pm\sqrt{5700.4}}{-9.8}$$
$$\doteq 17.09 \text{ and } 1.68$$

$\therefore$ The flare's height is 150 m at approx 1.68 s and again at 17.09 s.

b) the rocket's height will be greater than 150 m for 17.09 − 1.68 or 15.41 s

16.



P = 60 cm

(i) $a=P-s_1-s_2$

$$=60-x-(2x+6$$
$$=60-x-2x-6$$
$$=54-3x$$

(ii) $a^2+b^2=c^2$

$$(54-3x)^2+x^2=(2x+6)^2$$
$$2916-324x+9x^2+x^2=4x^2+24x+36$$
$$6x^2-348x+2880=0$$
$$6(x^2-58x+480)=0$$
$$6(x-48)(x-10)=0$$
$$x=10 \text{ or } x=\cancel{48}$$

inadmissible

$\therefore$ The sides are 10 cm, 2(10)+6 or 26 cm and 54−3(10) or 24 cm.