Unit3

12) a) $y=-3x^2-24x-36$ 

$0=-3(x^2+8x+12)$

$0=-3(x+6)(x+2)$

$x=\{-6,-2\}$.

max

$x_v=\frac{-6+(-2)}{2}=-4$ $\qquad V(-4,12)$

$y_v=-3(-4)^2-24(-4)-36$

$=-48+96-36$

c) $y=-(x+4)(2x-1)$

$x=\{-4,\frac{1}{2}\}$

$X_v=\frac{-4+\frac{1}{2}}{2}=\frac{\frac{-7}{2}}{2}=\frac{-7}{4}$

$y_v=\frac{81}{8}$ $\qquad \therefore V(-\frac{7}{4},\frac{81}{8})$

13) $y=x^2-3x-10$ (1)
$y=-5x-2$ (2)
POI(s).

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

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

$(x+4)(x-2)=0$

$x=-4 \qquad x=2$

$y=-5(-4)-2 \qquad y=-5(2)-2$

$=18 \qquad =-12$

$\therefore$ $(-4,18)$ and $(2,-12)$ are the POIs.

b) $y=2(x-1)^2-8$ $\qquad V(1,-8)$

$0=2(x-1)^2-8$

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

$(x-1)^2=4$ $\qquad x=\{3,-1\}$

$x-1=2$ $\qquad x-1=-2$

$x=3$ $\qquad x=-1$

d) $y=5x^2-21x+4$

$=5x^2-20x-1x+4$

$=5x(x-4)-1(x-4)$

$=(5x-1)(x-4)$

$x=\{4,\frac{1}{5}\}$

$x_v=\frac{4+\frac{1}{5}}{2}=\frac{21}{10}$

$y_v=-18\frac{1}{20}=\frac{-361}{20}$

$V(\frac{21}{10},-\frac{361}{20})$

14) $h(t) = -2t^2 + 20t + 1.5$

a) initial height → 1.5 m.

Sub $t=0$: $h(0) = -2(0)^2 + 20(0) + 1.5 = 1.5$ m.

b) max height? Complete the square.

$= (-2t^2 + 20t) + 1.5$

$= -2(t^2 - 10t) + 1.5$

$= -2(t^2 - 10t + 25 \; -25) + 1.5$ x−2

$= -2(t^2 - 10t + 25) + 1.5 + 50$

$= -2(t-5)^2 + 51.50$

∴ Max height was 51.5 m

c) when does the ball reach max height?

After 5 seconds.

d) hit the ground? Set $h=0$ USE QF

$-2(t-5)^2 + 51.50 = 0$

$-2(t-5)^2 = -51.50$

$(t-5)^2 = 25.75$

$t-5 = 5.07 \Rightarrow t = 10.07$

$t-5 = -5.07 \Rightarrow \cancel{t = -0.07}$ inadmissible.

∴ Tennis balle hit the ground after 10.07 seconds.

15) Let x represent number of times the price decreases.

$R = (15 - x)(200 + 25x)$ → expand, simplify, then complete the square. (Price) (# shirts.)

OR average the zeros.

$= 3000 + 375x - 200x - 25x^2$

$= (-25x^2 + 175x) + 3000$

$= -25(x^2 - 7x + 12.25 - 12.25) + 3000$

$= -25(x - 3.5)^2 + 3306.25$

$x = 3.5$

Price $= 15 - x$

$= 15 - 3.5$

$= \$11.50$.

Unit 4

16) a) $\left(\frac{27}{125}\right)^{-\frac{2}{3}}$

$=\left(\frac{125}{27}\right)^{\frac{2}{3}}$

$=\left(\sqrt[3]{\frac{125}{27}}\right)^{2} = \left(\frac{5}{3}\right)^{2}$

$=\boxed{\frac{25}{9}}$

b) $(-16)^{-4}$

$=\frac{1}{(-16)^{4}}$

$=\frac{1}{65536}$

c) $\frac{2^{3}+2^{-2}}{2^{3}} = \frac{\cancel{8}+\frac{1}{2^{2}}}{8}$

$=\frac{\cancel{8}+\frac{1}{4}}{8}$ common d.

$=\frac{5}{4}\div\frac{8}{1}=\frac{5}{4}\times\frac{1}{8}$

$=5/32$

17) Simplify:

a) $(-4x^{2}y^{-3}z^{-5})^{3}$

$=(-4)^{3}x^{6}y^{-9}z^{-15}$

$=\frac{-64x^{6}}{y^{9}z^{15}}$

b) $\left(\frac{2a^{-3}b^{5}c^{2}}{18a^{1}b^{-1}}\right)^{-\frac{1}{2}}$

$=\left(\frac{1b^{6}c^{2}}{9a^{4}}\right)^{-\frac{1}{2}}$

$=\left(\frac{9a^{4}}{b^{6}c^{2}}\right)^{\frac{1}{2}}=\frac{3a^{2}}{b^{3}c}$

c) $\sqrt{\sqrt[5]{4x^{4}}}$

$=(2x^{2})^{\frac{1}{5}}$

$=2^{\frac{1}{5}}x^{\frac{2}{5}}$

18)



f(x)	Domain	Range	inc dec ?	Intercepts set x=0	asymptotes
2^{x}	$\{x\in\mathbb{R}\}$	$\{y\in\mathbb{R}\mid y>0\}$	INC	1	$y=0$
$\left(\frac{1}{2}\right)^{x}$	$\{x\in\mathbb{R}\}$	$\{y\in\mathbb{R}\mid y>0\}$	DEC	1	$y=0$
5^{x}	$\{x\in\mathbb{R}\}$	$\{y\in\mathbb{R}\mid y>0\}$	INC	1	$y=0$

19) $f(x)=\left(\frac{1}{3}\right)^{x}$

$$y=-2\left(\frac{1}{3}\right)^{\frac{1}{2}x-1}$$

$$=-2\left(\frac{1}{3}\right)^{\frac{1}{2}(x-2)}$$

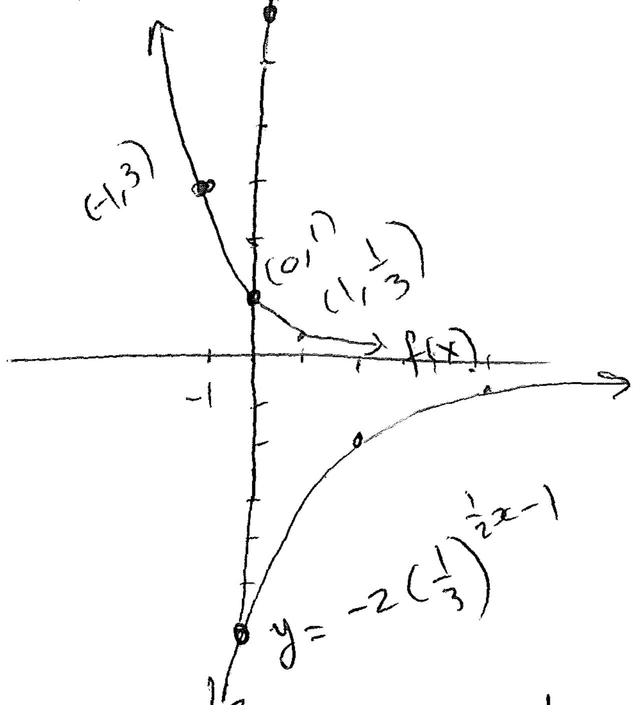
- Reflection around x-axis
- Vertically stretched by a factor of 2.
- horizontally stretched by a factor of 2.
- translation 2 units to the right.

$(x,y)\to(2x+2, -2y)$

$(-1,3)\to(0, -6)$

$(0,1)\to(2,-2)$

$(1,\frac{1}{3})\to(4,-\frac{2}{3})$



(20) $P(t)=500(2)^{\frac{t}{10}}$

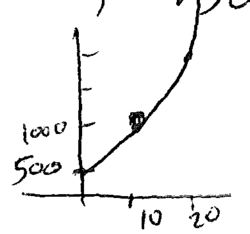
a) $\frac{t}{10}$ because double life is 10.

b) Initial population was 500.

b) double life ⇒ 2

d) $P(12)=500(2)^{\frac{12}{10}}\approx 1148$ → Round down for population.

e)



(0, 500)
(10, 1000)
(20, 2000)