§1.2.2

(a) $y = \frac{x-6}{x+6}$ is a rational function

(b) $y = x + \frac{x^2}{\sqrt{x-1}}$ is algebraic

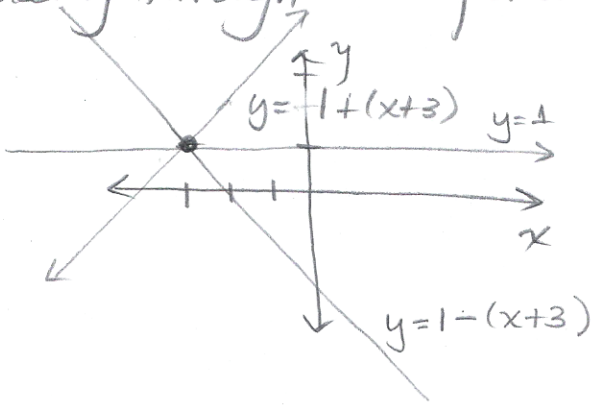
(c) $y = 10^x$ is an exponential function

(d) $y = x^{10}$ is a power function

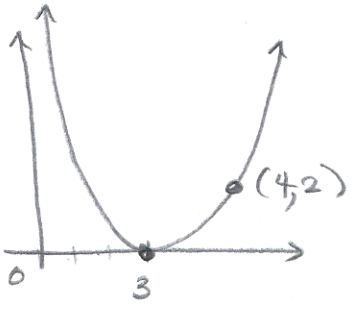
(e) $y = 2t^6 + t^4 - \pi$ is a polynomial of degree 6.

(f) $y = \cos\theta + \sin\theta$ is the sum of trig functions

1.2.6 Members of the family $f(x) = 1 + m(x+3)$ are all lines passing through the point $(-3, 1)$.



1.2.8 Find an expression for the quadratic functions shown



parabola w/ vertex $(0,3)$ pointing up.

$y = A(x-3)^2$ where A is constant.

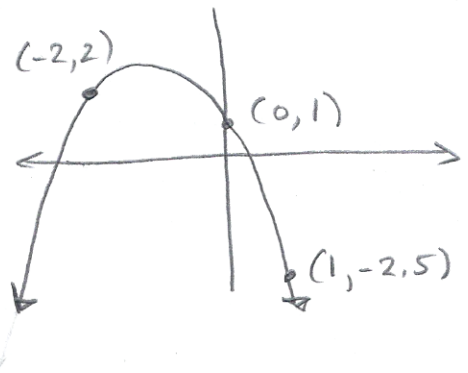
since $(4,2)$ on graph

$2 = A(4-3)^2$

$2 = A$.

So equation is $y = 2(x-3)^2$

1.2.8 continued



GENERAL FORM OF PARABOLA

$$y = Ax^2 + Bx + C.$$

USE THE 3 POINTS TO DETERMINE A, B, C.

$(0,1)$: $1 = A\cdot(0)^2 + B(0) + C$ (1)

$(-2,2)$: $2 = A\cdot 2^2 + B(2) + C$ (2)

$(1,-2.5)$: $-2.5 = A(1)^2 + B(1) + C$ (3)

EQUATION (1) YIELDS $C = 1$.

SUBSTITUTING INTO (2) & (3)

$$\left.\begin{aligned} 2 &= 4A + 2B + 1 \\ -2.5 &= A + B + 1 \end{aligned}\right\} \Rightarrow \left.\begin{aligned} 1 &= 4A + 2B \\ -3.5 &= A + B \leftarrow \text{MULT. BY 2} \end{aligned}\right\} \Rightarrow$$

$$1 = 4A + 2B$$

SUBTRACT $\quad -7 = 2A + 2B$

$$8 = 2A$$

So $A = 4$. SUBSTITUTE INTO (2).

$$2 = 4\cdot 2^2 + B(2) + 1$$

$$2 = 16 + B(2) + 1$$

$$-15 = 2B$$

$$-7.5 = B$$

So $y = 4x^2 - 7.5x + 1$

1.2.11 D = dosage for adult

$C = 0.0417D(a+1)$ is dosage for child w/ age a.

(a) The slope is the coefficient of the input (a). So the slope is $.0417D$. If $D = 200$ mg this is 8.34 mg/yr. It represents the amount of drug given for each year of a child's age.

(b) A newborn is 0 yrs old. So the dosage would be $C(0) = .0417(200)(0+1) = 8.34$ mg.

1.2.15 Chirping rate of crickets appears to be linear with respect to temperature.

DATA

CHIRPS/MIN	TEMP.
173	80°F
113	70°F

(a) FIND EQ. OF TEMPERATURE, T, AS A FUNCTION OF CHIRPS/MIN.

$$\frac{\Delta T}{\Delta c} = \frac{80-70}{173-113} = \frac{10}{60} = \frac{1}{6}.$$

So $$\frac{T-70}{c-113} = \frac{1}{6}$$

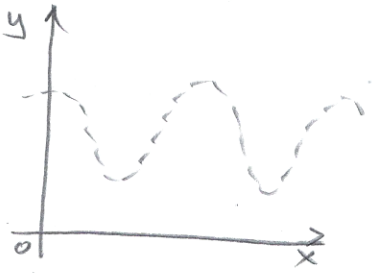
$$T = 70 + \frac{1}{6}(c-113)$$

(b) slope is $\frac{1}{6}$ °/chirp/min. An increase of 1 chirp/min signals a $\frac{1}{6}$ degree increase in temperature.

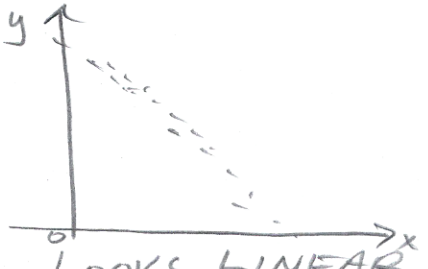
(c) Find T if $c=150$.

$$T = 70 + \frac{1}{6}(150-113) \approx 76.2\ ^\circ F$$

1.2.19

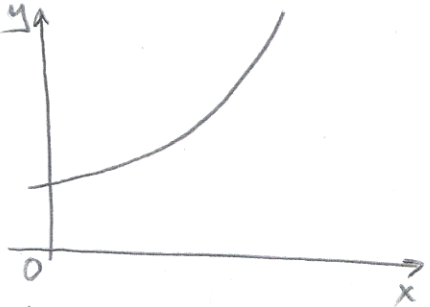


LOOKS LIKE A SHIFTED SINE FUNCTION SINCE IT IS OSCILLATING WITH A FIXED PERIOD.

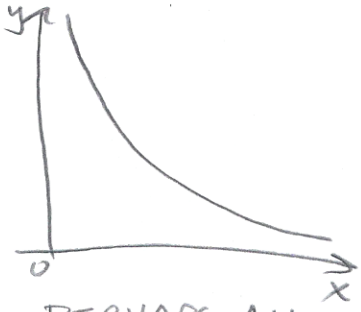


LOOKS LINEAR.

1.2.20



LOOKS LIKE A POWER FUNCTION. PROBABLY x^2 SHIFTED.



PERHAPS AN EXPONENTIAL FUNCTION e^{-x}