

3.7 Families of Parabolas

$$f(x) = a(x-r)(x-s)$$

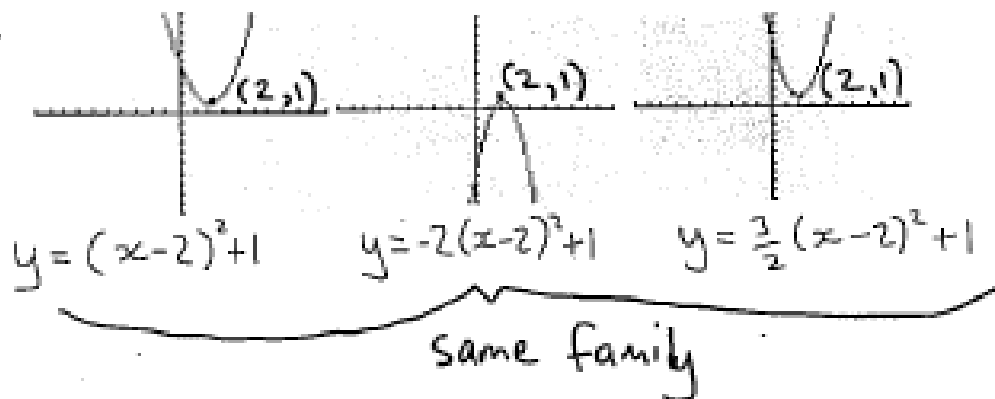
Functions with the same r and s value are in the same family in that they share the same roots.

eg. $f(x) = 2(x-1)(x+2)$
and $g(x) = 3(x-1)(x+2)$
are in the same family

$$f(x) = a(x-h)^2 + k$$

Functions with the same h and k value are in the same family in that they share the same vertex.

eg.



$$f(x) = ax^2 + bx + c$$

Functions with the same c value are in the same family in that they share the same y -intercept.

complete p192 #1-6, 8-11

Examples

point $(-2, 5)$ is given

- ① Given $f(-2) = 5$ and $f(x) = 2x^2 + bx - 4$, determine the value of b .

$$\text{sub in } (-2, 5) \rightarrow 5 = 2(-2)^2 + b(-2) - 4$$

$$5 = 2(4) - 2b - 4$$

$$5 = 8 - 2b - 4$$

$$5 = 4 - 2b$$

$$1 = -2b$$

$$\therefore \underline{\underline{b = -\frac{1}{2}}}$$

(The eqn of the parabola is $f(x) = 2x^2 - \frac{1}{2}x - 4$)

- ② Determine the equation of the quadratic function that passes through $(2, 8)$ if its zeros are at 1 and 7.

$$f(x) = a(x - 1)(x - 7)$$

$$\text{sub } (2, 8) \rightarrow 8 = a(2 - 1)(2 - 7)$$

$$8 = a(1)(-5)$$

$$8 = -5a$$

$$a = -\frac{8}{5}$$

\therefore The eqn of the quad. fxn is:

$$f(x) = -\frac{8}{5}(x - 1)(x - 7)$$

③ A missile was launched from the top of a 6 metre wall. After 3 seconds it reaches a max. height of 78 metres. Determine an equation that models the height of the rocket, in metres, against time, in seconds.

$$\text{vertex is } (3, 78) \rightarrow f(x) = a(x-3)^2 + 78$$

$$\text{sub } (0, 6) \rightarrow 6 = a(0-3)^2 + 78$$

$$6 = a(9) + 78$$

$$6 - 78 = 9a$$

$$a = -\frac{72}{9}$$

$$\underline{a = -8}$$

\therefore The eqn that models the height of the rocket is

$$\boxed{y = -8(x-3)^2 + 78}$$