

13. $f(x) = -2(x - 2)^2(x + 1)$

The input interpretation is $(x + 1)$

When we substitute x with Zero we get $-2(0-2)^2 = -2, (0-1) = -1$

the $(x-2)$ factor is repeated twice (in other words, squared), the multiplicity of the zero $x=2$ is 2

the $(x+1)$ factor is repeated twice (in other words, squared), the multiplicity of the zero $x=-1$ is 1

$x = 2$ multiplicity 2 $x = -1$ multiplicity 1

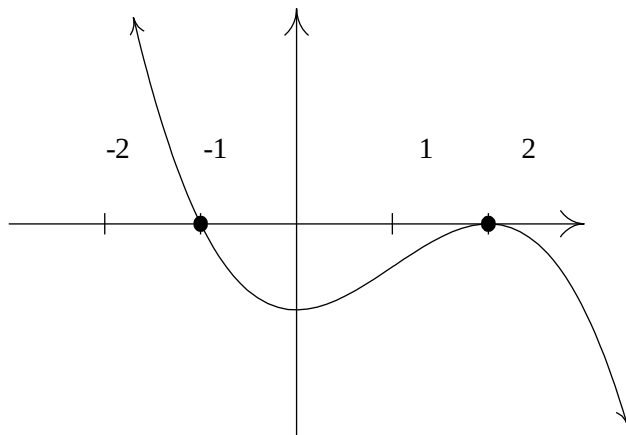
$(x-2)^2(x+1) > 0$, Although -2 affects the polynomial. Hence the sign of $F(x)$ is independent on the sign of the value of x .

At $x=-1$ the multiplicity is 1. Means it will be up at $(x+1)$, It will cross the x -axis at $x=-1$. It will bounce at $x=2$ and move downwards.

$F(x) = -2x^3 + 6x^2 - 2$. When we rewrite the equation to take positive. The equation remains the same-there is no positive Zeros.

When we input $(-x)$, $F(-x) = 2x^3 + 6x - 2$. We notice that there is change of signs. There are either 3 zeros because the polynomial degree is of 3 or there is one negative real Zero. In this case we have one negative real zero. Its corresponding to a multiplicity of 1.

At -1 , since the $x-1$ factor is squared, you approach downward. Somewhere between -1 and 2 the function reverses direction. At 2 it bounces downwards(decrease)



15. $F(x) = x^3(x + 2)^2$ $x = 0$ multiplicity 3 $x = -2$ multiplicity 2

In order for $F(x)$ to be zero, either x^3 has to be zero or $x + 2$ has to be zero. Since the $x + 2$ factor is repeated twice (in other words, squared), the multiplicity of the zero $x = -2$ is 2.

multiplicity of $x=0$ as $(x^3) = 3$ times and $x=-2$ multiplied twice= 2

Regardless of the value of $x^3, (x+2)^2$

$(x + 2)^2 > 0$. Hence the sign of $F(x)$ is dependent on the sign of the value of x .

So, as x gets large in the negative direction, $F(x)$ also gets large in the negative direction. As x gets large in the positive direction, $F(x)$ gets large in the positive direction.

At zero, $F(x)$ transitions from negative to positive going from left to right.

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At -2 , since the $x + 2$ factor is squared, you approach zero from below, become tangent to the x -axis at $x = -2$ and then decreases again. Somewhere between -2 and 0 , the function reverses direction reverses again and begins to increase

