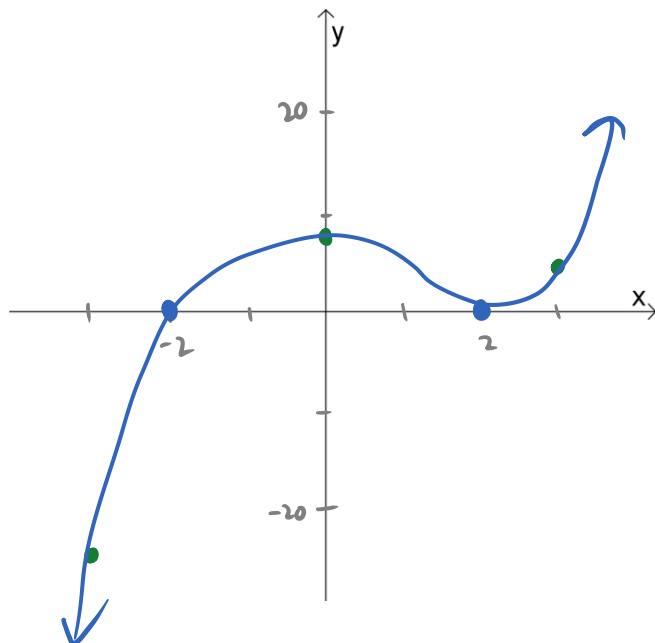


1. Sketch the graph of $f(x) = x^3 - 2x^2 - 4x + 8$. Be sure to show intercepts, test points (before smallest x -intercept, between x -intercepts, and after largest x -intercept), and end behavior. (Hint: This is a good time to brush up on your factor by grouping skills. ☺)



② Test points:

x	$f(x)$
-3	-25
0	8
3	5

① x -int:

$$x^3 - 2x^2 - 4x + 8 = 0$$

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

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

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

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

$$\boxed{x=2 \quad x=-2}$$

Note: Even multiplicity, so curve will "bounce" off x -axis here.

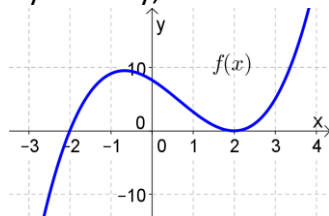
③ End behavior:

Leading term: x^3

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \infty$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow -\infty$$

By the way, here's how the computer graphed it:



Q: What can you catch, but not throw?

2. Let $f(x) = x^3 - x^2 - 6x$.

- a) Find the x -intercept(s) and the y -intercept of $f(x)$.

x -int (set $y=0$):

$$\begin{aligned} x^3 - x^2 - 6x &= 0 \\ x(x^2 - x - 6) &= 0 \\ x(x+2)(x-3) &= 0 \end{aligned}$$

$$x = 0, -2, 3$$

y -int (set $x=0$):

$$\begin{aligned} f(0) &= 0^3 - 0^2 - 6(0) \\ &= \boxed{0} \end{aligned}$$

- b) Find a test point between the x -intercepts of $f(x)$, as well as a test point before the first x -intercept, and a test point after the last x -intercept.

x	$f(x)$
-3	-18
-1	4
1	-6
4	24

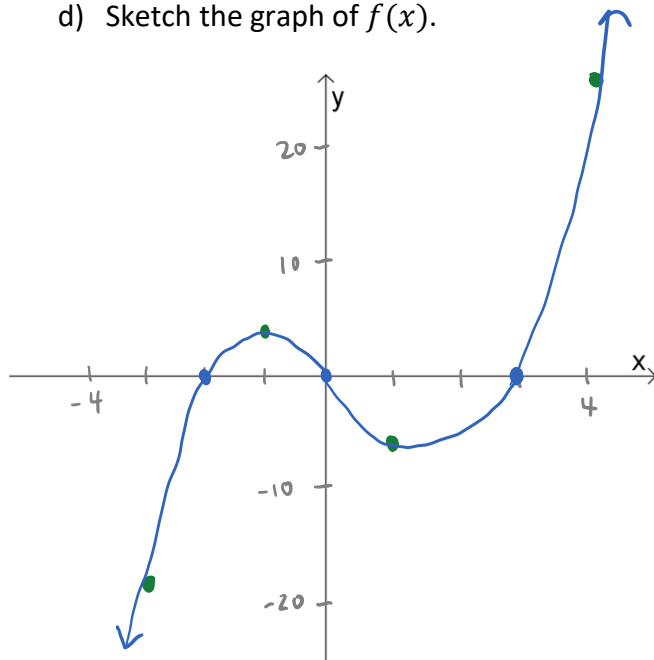
- c) Determine the end behavior of $f(x)$.

Leading term: x^3

As $x \rightarrow \infty$, $f(x) \rightarrow \infty$

As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$

- d) Sketch the graph of $f(x)$.



4. Let $f(x) = -2x^4 - x^3 + 3x^2$.

- a) Find the x -intercept(s) and the y -intercept of $f(x)$.

x -int (set $y=0$):

$$-2x^4 - x^3 + 3x^2 = 0$$

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

$$-x^2(2x+3)(x-1) = 0$$

$$x = 0, -\frac{3}{2}, 1$$

y -int (set $x=0$):

$$f(0) = -2(0)^4 - (0)^3 + 3(0)^2$$

$$= 0$$

- b) Find a test point between the x -intercepts of $f(x)$, as well as a test point before the first x -intercept, and a test point after the last x -intercept.

x	$f(x)$
-2	-12
-1	2
$\frac{1}{2}$	$\frac{1}{2}$
1.5	-6.75

I tried plugging in 2, but got -28, which would have stretched my y -axis scale. So I decided to use 1.5 instead.

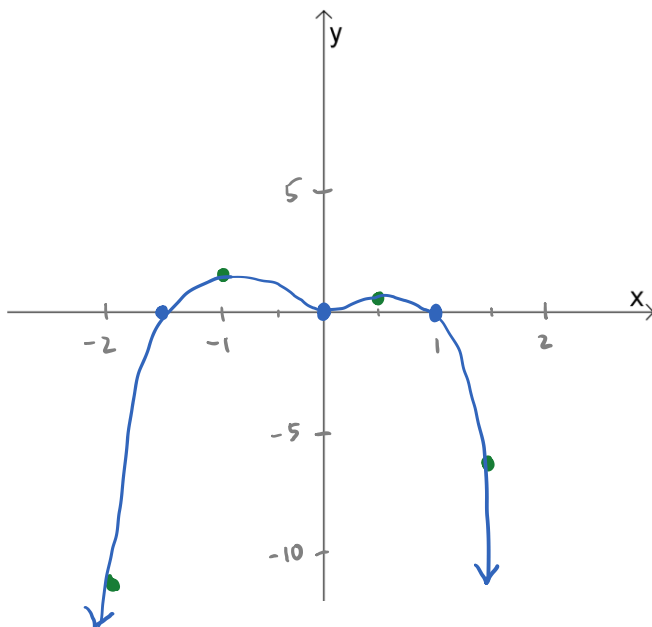
- c) Determine the end behavior of $f(x)$.

Leading term: $-2x^4$

As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$

As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$

- d) Sketch the graph of $f(x)$.



6. The graph of $P(x)$ is shown below.

a) Find the zeros of $P(x)$, and for each zero determine if the multiplicity is even or odd.

Zeros: -4 (odd multiplicity)
 1 (even multiplicity)
 3 (odd multiplicity)

b) How many turning points does $P(x)$ have?

3 turning points

c) What is the smallest possible degree of $P(x)$?

degree 4

d) Determine the end behavior of $P(x)$.

As $x \rightarrow \infty$, $P(x) \rightarrow -\infty$
As $x \rightarrow -\infty$, $P(x) \rightarrow -\infty$

