Example 2:    Graph the polynomial function.    a.)    $P(x) = (2x + 3)(x - 1)(x + 2)$

(1) Factor the polynomial completely.

   Already factored !    $P(x) = (2x + 3)(x - 1)(x + 2)$

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(2) Find the x - intercept(s) by solving $P(x) = 0$ and y - intercept(s) by evaluating $P(0)$.
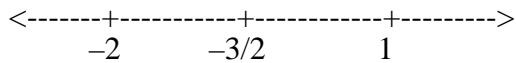
   x - intercepts (y = 0)

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

   $x = -3/2$              $x = 1$            $x = -2$

   y - intercepts (x = 0)

   $P(0) = (2(0) + 3)(0 - 1)(0 + 2) = (3)(-1)(2) = -6$          (0, -6) point

---

(3) Put the x - intercept(s) on a number line and test the intervals to determine where P is positive
   (above the x - axis) and negative (below the x - axis).

```
<-------+-----------+------------+--------->
     -2        -3/2          1
```

Test points:

(x = -3):    $(2(-3) + 3)(-3 - 1)(-3 + 2) = (-3)(-4)(-1) = -12$    <u>below</u>        $(-3, -12)$ point
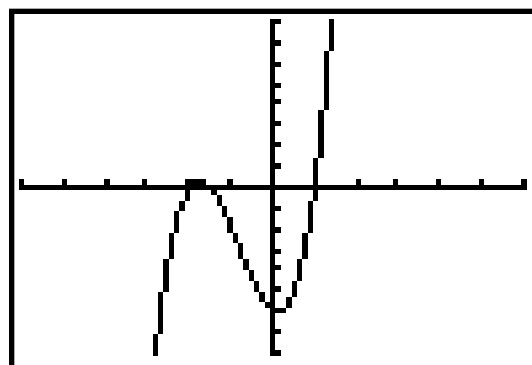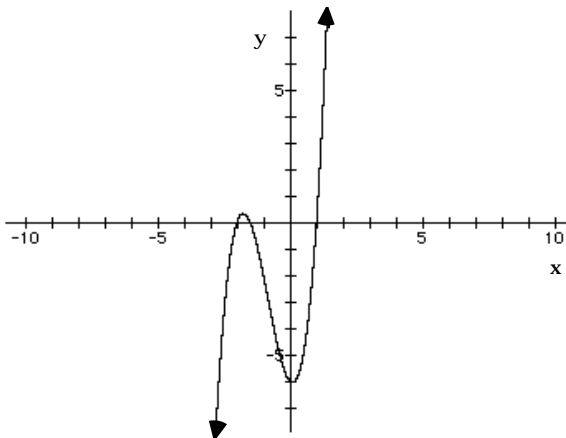
(x = -1.6):  $(2(-1.6) + 3)(-1.6 - 1)(-1.6 + 2) = (-.2)(-2.6)(.4) = .208$   <u>above</u>    $(-1.6, .208)$ point

(x = 0):     $(2(0) + 3)(0 - 1)(0 + 2) = (3)(-1)(2) = -6$      <u>below</u>        $(0, -6)$ point

(x = 2):     $(2(2) + 3)(2 - 1)(2 + 2) = (7)(1)(4) = 28$       <u>above</u>        $(2, 28)$ point

---

(4) Plot the intercepts and at least one other point in the middle intervals and use the other information to graph.

**Calculator Answer**

Example 2:    Graph the polynomial function.    b.)    $P(x) = 3x^4 + x^3 - 2x^2$

(1) Factor the polynomial completely.

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

---

(2) Find the x - intercept(s) by solving $P(x) = 0$ and y - intercept(s) by evaluating $P(0)$.
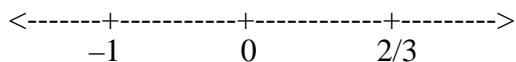
x - intercepts $(y = 0)$

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

$x = 0$          $x = 2/3$          $x = -1$

y - intercepts $(x = 0)$

$P(0) = (0)^2(3(0) - 2)((0) + 1)$          $(0, 0)$ point

---

(3) Put the x - intercept(s) on a number line and test the intervals to determine where P is positive (above the x - axis) and negative (below the x - axis).

```
<-------+-----------+------------+--------->
       −1          0           2/3
```
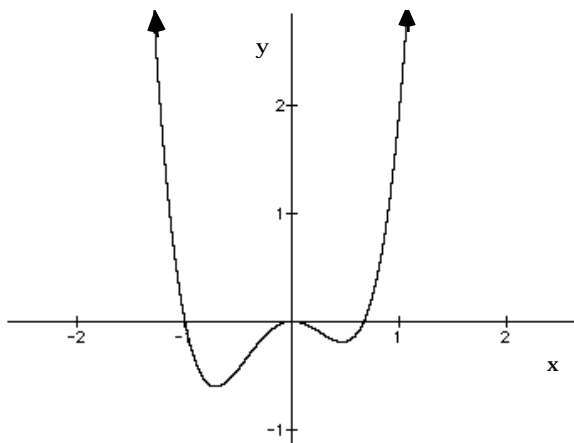
Test points:

$(x = -3)$:        $(-3)^2(3(-3) - 2)((-3) + 1) = 198$    <u>above</u>                    $\boxed{(-3, 198) \text{ point}}$

$(x = -.5)$:        $(-.5)^2(3(-.5) - 2)((-.5) + 1) = -.4375$ <u>below</u>          $\boxed{(-.5, -.4375) \text{ point}}$

$(x = 1/3)$:        $(1/3)^2(3(1/3) - 2)((1/3) + 1) = -.148$ <u>below</u>          $\boxed{(1/3, -.148) \text{ point}}$

$(x = 1)$:        $(1)^2(3(1) - 2)((1) + 1) = 2$    <u>above</u>                    $\boxed{(1, 2) \text{ point}}$

---

(4) Plot the intercepts and at least one other point in the middle intervals and use the other information to graph.

**Calculator Answer**