

1) Solve for all values of x in simplest form: $x^2 = 4x - 22$

Key

$$x^2 - 4x + 22 = 0$$

$a=1$ $b=-4$ $c=22$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(22)}}{2(1)}$$

$\sqrt{-72}$
 $i\sqrt{36 \cdot 2}$
 $6i\sqrt{2}$

$$x = \frac{4 \pm \sqrt{-72}}{2} = \frac{4 \pm 6i\sqrt{2}}{2} = \boxed{2 \pm 3i\sqrt{2}}$$

2) Given the equation of the parabola $y = \frac{1}{8}(x - 3)^2 + 1$,

a) Find the vertex

$$\boxed{(3, 1)}$$

b) Find the focus

$$\frac{1}{4p} = \frac{1}{8} \quad \boxed{(3, 3)}$$

$p=2$
 $y\text{-val: } 1+2=3$

c) Find the equation of the directrix.

$y\text{-val: } 1-2=-1$

$$\boxed{y = -1}$$

3) Express the roots of the equation $-6x = 2x^2 + 5$ in simplest $a + bi$ form

$$2x^2 + 6x + 5 = 0$$

$a=2$ $b=6$ $c=5$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(2)(5)}}{2(2)}$$

$$x = \frac{-6 \pm \sqrt{-4}}{4} = \frac{-6 \pm 2i}{4} = \boxed{-\frac{3}{2} \pm \frac{1}{2}i}$$

4) Factor completely: $6a^2 + 9ab - 3b - 2a$

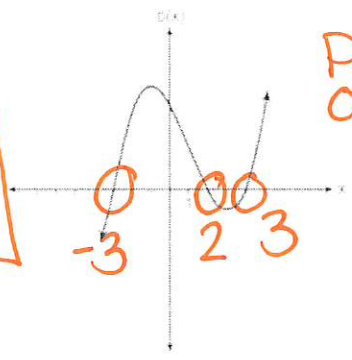
$$(6a^2 - 2a) + (9ab - 3b)$$

$$2a(3a - 1) + 3b(3a - 1)$$

$$\boxed{(3a - 1)(2a + 3b)}$$

5) Write a possible equation for the function shown below.

$$\boxed{p(x) = (x+3)(x-2)(x-3)}$$



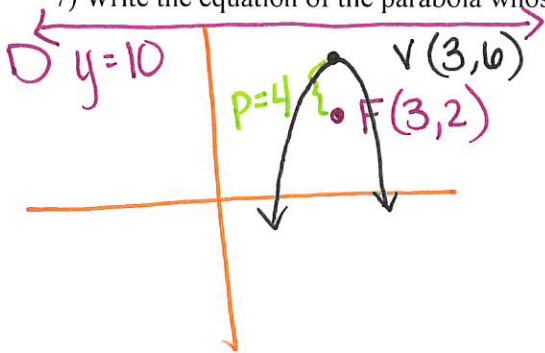
positive
odd degree

6) Solve for all possible roots of x : $\sqrt{x+4} + 8 = 7$

$$\begin{aligned} \sqrt{x+4} + 8 &= 7 \\ \sqrt{x+4} &= -8 - 8 \\ \sqrt{x+4} &= -16 \\ x+4 &= 256 \\ x &= 252 \end{aligned}$$

$\{ \}$

7) Write the equation of the parabola whose focus is $(3, 2)$ and whose directrix is $y = 10$.



$$\begin{aligned} y &= \frac{-1}{4p}(x-h)^2 + k \\ y &= \frac{-1}{4(4)}(x-3)^2 + 6 \\ y &= -\frac{1}{16}(x-3)^2 + 6 \end{aligned}$$

8) Find the product of $(-2 + 6i)$ and $(3 + 4i)$ in simplest $a + bi$ form. Show all work and check on the calculator.

$$(-2 + 6i)(3 + 4i) \quad i^2 = -1$$

$$-6 - 8i + 18i + 24i^2$$

$$-6 + 10i + 24(-1)$$

$$-6 + 10i - 24 \rightarrow -30 + 10i$$

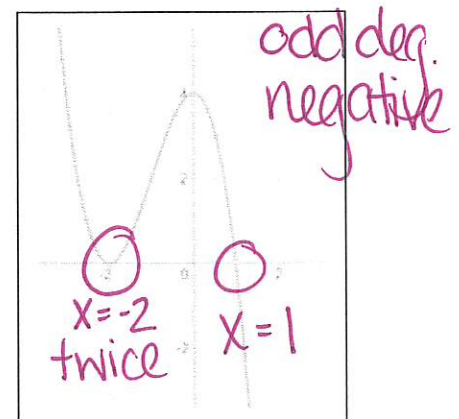
9) Factor completely: $x^3 - 2x^2 - 9x + 18$

$$\begin{aligned} (x^3 - 2x^2) + (-9x + 18) \\ x^2(x-2) - 9(x-2) \\ (x-2)(x^2-9) \end{aligned}$$

$$(x-2)(x+3)(x-3)$$

10) Write a possible equation for the function shown.

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



11) The roots of the equation $3x^2 - 4x + 2 = 0$ in simplest form are:

$a=3 \quad b=-4 \quad c=2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{(-4)^2 - 4(3)(2)}}{2(3)} = \frac{4 \pm \sqrt{-8}}{6}$$

$i\sqrt{4} = 2i$

$$= \frac{4 \pm 2i\sqrt{2}}{6}$$

12) Factor completely: $(x^3 + 3x^2) + (2x + 6)$

$$x^2(x+3) + 2(x+3)$$

$$(x+3)(x^2+2)$$

$$\frac{\frac{2}{3} + \frac{\sqrt{2}i}{3}}$$

13) Simplify the expression $\sqrt[3]{27a^6b^3c^2}$.

$$\sqrt[3]{27} \sqrt[3]{a^6} \sqrt[3]{b^3} \sqrt[3]{c^2}$$

$$3a^2b\sqrt[3]{c^2}$$

14) Solve for all values of x in simplest radical form: $2x^2 - 14x - 16 = 0$

$a=2 \quad b=-14 \quad c=-16$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{14 \pm \sqrt{(14)^2 - 4(2)(-16)}}{2(2)} = \frac{14 \pm \sqrt{324}}{4} = \frac{14 \pm 18}{4}$$

$\frac{14+18}{4} = 8$
 $\frac{14-18}{4} = -1$

15) Express $(2 + 3i)^2$ in simplest $a + bi$ form. Show all work and check on your calculator.

$$(2+3i)(2+3i) \quad i^2 = -1$$

$$4 + 6i + 6i + 9i^2$$

$$4 + 6i + 6i + 9(-1)$$

$$4 + 6i + 6i - 9$$

$$-5 + 12i$$

16) The vertex of a parabola has the coordinates of (2, 3) and its focus is located at (2, 4).

a) Find the equation of its directrix.

focus: (2, 4)
vertex: (2, 3) ← p=1

$$\text{dir: } y = 2$$

b) Find the equation of the parabola.

$$y = \frac{1}{4p}(x-h)^2 + k$$

$$y = \frac{1}{4}(x-2)^2 + 3$$