Determine the vertex of the function $f(x) = -x^2 + 8x - 5$.

Using formulas

$$h = \frac{-b}{2a} \quad \text{and} \quad k = \frac{4ac - b^2}{4a} \quad \text{or} \quad k = f(h)$$

$$f(x) = \underset{a}{-1}x^2 \underset{b}{+8}x \underset{c}{-5}$$

$$h = \frac{-b}{2a} = \frac{-8}{-2}$$

$$h = +\frac{8}{2} = 4$$

$$k = \frac{4ac - b^2}{4a} = \frac{4(-1)(-5) - (8)^2}{-4}$$

$$k = \frac{20 - 64}{-4} = \frac{-44}{-4} = 11$$

$$\therefore V(4,11)$$

What is the vertex of the function $f(x)=5x^2-3x+11$?

$$h=\frac{-(-3)}{10}=\frac{3}{10}=0.3$$

$$k=f(h) \longrightarrow k=f(0.3)=5(0.3)^2-3(0.3)+11$$

$$k=5(0.09)-0.9+11$$

$$k=0.45-0.9+11$$

$$k=10.55=\frac{211}{20}$$

$k = \frac{9(5)(11)-(-3)^2}{9(5)}$

$= \frac{220-9}{20}$

$= \frac{211}{20}$

$$\therefore V(0.3,10.55)$$

Write $f(x)=\frac{2}{3}(x-6)^2+1$ in general form.

$f(x) = \frac{2}{3}(x^2 - 12x + 36) + 1$

$f(x) = \frac{2}{3}x^2 - 8x + 24 + 1$

$f(x) = \frac{2}{3}x^2 - 8x + 25$

Write $f(x)=-0.5x^2+7x-25$ in standard form.

$-14 \div 2 = 7$
$(-7)^2 = 49$

① $f(x) = -0.5(x^2 - 14x) - 25$

$f(x) = -0.5(x^2 - 14x + 49 - 49) - 25$

$f(x) = -0.5((x-7)^2 - 49) - 25$

$f(x) = -0.5(x-7)^2 + 24.5 - 25$

$f(x) = -0.5(x-7)^2 - 0.5$

② $a = -0.5$

$h = \frac{-7}{-1} = 7$

$k = \frac{4(-0.5)(-25) - 7^2}{-2}$

$k = -\frac{1}{2}$

$f(x) = -0.5(x-7)^2 - \frac{1}{2}$

For what values of x is the function $f(x) = 3x^2 - 10x + 9$ equal to 17?

let $y = 17$

$$17 = 3x^2 - 10x + 9$$

$$0 = 3x^2 - 10x - 8$$

factor or quadratic formula

$x = \frac{10 \pm \sqrt{100 - 4(3)(-8)}}{6}$

$= \frac{10 \pm \sqrt{196}}{6} = \frac{10 \pm 14}{6}$

$m \times n = 3 \times -8 = -24$

$m + n = -10$

$\{-12, 2\}$

$$0 = 3x^2 - 12x + 2x - 8$$

$$0 = 3x(x-4) + 2(x-4)$$

$$0 = (x-4)(3x+2)$$

$x_1 = \frac{24}{6} = 4$

$x_2 = \frac{-4}{6} = \frac{-2}{3}$

$x - 4 = 0$ $\quad$ $3x + 2 = 0$

$x = 4$ $\quad$ $x = -\frac{2}{3}$

$$x = \left\{-\frac{2}{3}, 4\right\}$$

For what values of x is the function $f(x) = -2(x-4)^2 + 18$ equal to 2?

$2 = -2(x-4)^2 + 18$

$-2 \quad -2$

$0 = -2(x-4)^2 + 16$

Isolate x

$2 = -2(x-4)^2 + 18$

$-16 = -2(x-4)^2$

$8 = (x-4)^2$

$\pm\sqrt{8} = x-4$

① $\sqrt{8}+4 = x$ ② $-\sqrt{8}+4 = x$

$x = h \pm \sqrt{-\frac{k}{a}} \Rightarrow x = 4 \pm \sqrt{\frac{-16}{-2}}$

$= 4 \pm \sqrt{8}$

4 ± 2.83

① $x = 1.17$

② $x = 6.83$

For what values of x is the function $f(x) = 2x^2 + x - 15$ equal to 1?

let $y = 1$

$1 = 2x^2 + x - 15$

$m \times n = -32$
$m + n = 1$

$0 = 2x^2 + x - 16$ Use the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-1 \pm \sqrt{1 - 4(2)(-16)}}{4}$$

$$x = \frac{-1 \pm \sqrt{1 + 128}}{4}$$

$$x = \frac{-1 \pm \sqrt{129}}{4}$$

$$x \approx \frac{-1 + 11.36}{4} \qquad x \approx \frac{-1 - 11.36}{4}$$

$$x \approx 2.59 \qquad x \approx -3.09$$

$x = \{2.59, -3.09\}$

Given the function $f(x) = -4(x-7)^2 + 9$, determine when $f(x) = -7$.

$$-7 = -4(x-7)^2 + 9$$
$$-9 \qquad\qquad -9$$
$$\frac{-16}{-4} = \frac{-4(x-7)^2}{-4}$$
$$4 = (x-7)^2$$
$$\pm 2 = x - 7$$
$$x_1 = -2 + 7 \qquad x_2 = 2 + 7$$
$$x = \{5, 9\}$$