Solutions

1) $x^2 - x - 12 = 0$

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

$\boxed{x = -3}$ $\boxed{x = 4}$

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

$(x + 1)(x - 4)$

$\boxed{x = -1}$ $\boxed{x = 4}$

3) $\sqrt{x^2} = \pm\sqrt{25}$

$\boxed{x = \pm 5}$

4) $4x^2 - 17x + 4 = 0$

$(4x - 1)(x - 4)$

$4x - 1 = 0$ $\boxed{x = 4}$

$4x = 1$

$\boxed{x = 1/4}$

5) $x^2 - x - 12 = 0$ $\quad x = \dfrac{1 \pm \sqrt{(-1)^2 - 4(1)(-12}}{2(1)}$

$x = \dfrac{1 \pm \sqrt{1 + 48}}{2}$

$x = \dfrac{1 \pm \sqrt{49}}{2} \longrightarrow \dfrac{1+7}{2}$ or $\dfrac{1-7}{2}$

$= \boxed{4 \text{ or } -3}$

6) $4x^2 - 17x + 4 = 0$

$$x = \frac{17 \pm \sqrt{(-17)^2 - 4(4)(4)}}{2(4)}$$

$$x = \frac{17 \pm \sqrt{289 - 64}}{8} = \frac{17 \pm \sqrt{225}}{8} = \frac{17 \pm 15}{8}$$

$$= \frac{32}{8} \text{ or } \frac{2}{8} = \boxed{4 \text{ or } \frac{1}{4}}$$

7) $-3x^2 + 4x - 4 = 0$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(-3)(-4)}}{2(-3)} = \frac{-4 \pm \sqrt{16 - 48}}{-6}$$

$$\rightarrow \frac{-4 \pm \sqrt{-32}}{-6} = \frac{-4 \pm \sqrt{-1}\sqrt{16}\sqrt{2}}{-6} = \frac{-4 \pm 4i\sqrt{2}}{-6}$$

$$= \boxed{\frac{-2 \pm 2i\sqrt{2}}{-3}}$$

8) $y = 4(x+3)^2 + 1$

Vertex $= (-3, 1)$

$x = -3$

up

9) $f(x) = -2(x-2)^2 - 2$

Vertex $= (2, -2)$, $x = 2$, Down ↓

10) $f(x) = x^2 + 6x - 3$

$f(x) = (x^2 + 6x + \underline{9}) - 3 - \underline{9}$

$f(x) = (x+3)^2 - 12$

Vertex $= (-3, -12)$, $x = -3$, up ↑

11) $f(x) = 3x^2 - 18x + 11$

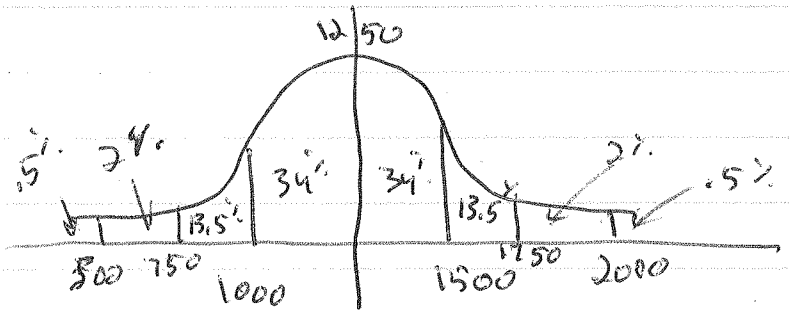
$f(x) = 3(x^2 - 6x + \underline{9}) + 11 - \underline{3(9)}$

$+11 \quad -27$

$f(x) = 3(x-3)^2 - 16$

vertex $= (3, -16)$, $x = 3$, up ↑

12)



a) $13.5 + 2 + .5 = 16\%$ $\quad 10{,}000(.16) = 1600$ workers

b) $2\% + .5\% = 2.5\%$ $\quad 10{,}000(.025) = 250$ workers

c) ~~$2\% + 13.5\% + 34\% + 34\%$~~ $\quad 2 + 13.5 + 34 + 34 + 13.5$

$= 97\%$

d) 97.5%