HW #17 (3.1) 10, 18, 26, 32, 34, 36, 40, 44, ~~66~~, 78

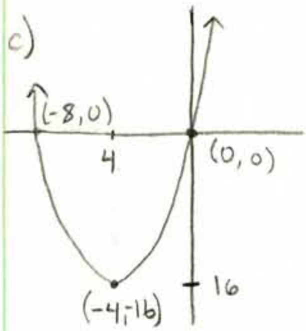
10) $f(x) = x^2 + 8x$

a) $f(x) = x^2 + 8x \boxed{= (x+4)^2 - 16}$

b) $\boxed{\text{vertex is } (-4, -16)}$ x-intercepts: $y = 0 = x^2 + 8x$
$= x(x+8) \Rightarrow \boxed{x = 0, -8}$

y-intercepts: $x = 0 = y = 0 \Rightarrow \boxed{y = 0}$

c)



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

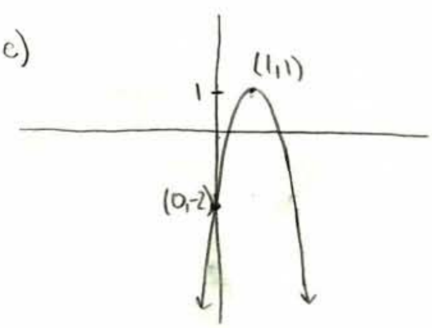
a) $f(x) = -3x^2 + 6x - 2 \boxed{= -3(x-1)^2 + 1}$

b) $\boxed{\text{vertex is } (1,1)}$

x-intercept: $y = 0 \Rightarrow 0 = -3(x-1)^2 + 1$
$\frac{1}{3} = (x-1)^2$
$\sqrt{\frac{1}{3}} = x - 1 \Rightarrow \boxed{x = 1 \pm \sqrt{\frac{1}{3}}}$

y-intercept: $x = 0 \Rightarrow \boxed{y = -2}$

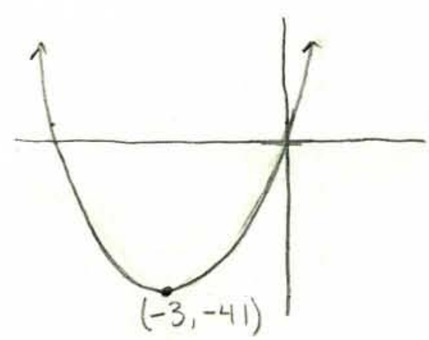
c)



26) $f(x) = 5x^2 + 30x + 4$

a) $f(x) = 5(x^2 + 6x) + 4$
$= 5(x^2 + 6x + 9) + 4 - 45$
$\boxed{= 5(x+3)^2 - 41}$

b)

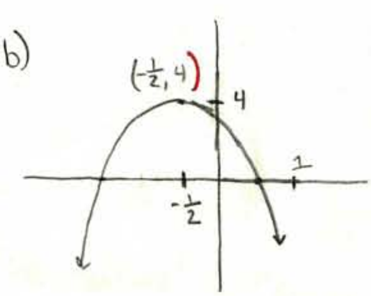


c) The $\boxed{\text{max value is } f(-3) = -41}$

32) $h(x) = 3 - 4x - 4x^2$

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

b)



c) The $\boxed{\text{max value is } h(-\frac{1}{2}) = 4}$

34, 36, 40, 44, 66, 78

34) $f(x) = 1 + 3x - x^2$

$$f(x) = -(x^2 - 3x) + 1$$
$$= -(x^2 - 3x + \tfrac{9}{4}) + 1 + \tfrac{9}{4}$$
$$= -(x - \tfrac{3}{2})^2 + \tfrac{13}{4}$$

So, $\boxed{\text{max value is } f(\tfrac{3}{2}) = \tfrac{13}{4}}$

36) $f(t) = 10t^2 + 40t + 113$

$$f(t) = 10(t^2 + 4t) + 113$$
$$= 10(t^2 + 4t + 4) + 113 - 40$$
$$= 10(t+2)^2 + 73$$

so, $\boxed{\text{min value is } f(-2) = 73}$

40) $f(x) = -\frac{x^2}{3} + 2x + 7$

$$f(x) = -\tfrac{1}{3}(x^2 - 6x) + 7$$
$$= -\tfrac{1}{3}(x^2 - 6x + 9) + 7 + 3$$
$$= -\tfrac{1}{3}(x - 3)^2 + 10$$

so, $\boxed{\text{max value is } f(3) = 10}$

44) Find a function with vertex (3,4) and passes through (1,-8)

$y = a(x-3)^2 + 4$ vertex (3,4)
$-8 = a(1-3)^2 + 4$ point (1,-8)
$-8 = 4a + 4$
$4a = -12$
$a = -3$ so $y = -3(x-3)^2 + 4 \boxed{= -3x^2 + 18x - 23}$

66) $P(x) = -0.001x^2 + 3x - 1800$
$= -0.001(x^2 - 3000x) - 1800$
$= -0.001(x^2 - 3000x + 2,250,000) - 1800 + 2250$
$= -0.001(x - 1500)^2 + 450$

So, the venders max profit occures when he <u>sells 1500 cans</u> and <u>profit is $450</u>

78) a) $P(x) = (40-2x)(x-6) \boxed{= -2x^2 + 52x - 240}$

b) profit is maximized when $x = \frac{-b}{2a} = \frac{-52}{2(-2)} = 13$ so, when its $\boxed{\$13 \text{ per feeder}}$

max weekly profit is $P(13) = -2(13)^2 + 52(13) - 240 \boxed{= \$98}$