2/11/2011

Section 12

§2.5

Summary Review

$y = ax^2 + bx + c$

- a: leading coefficient
- c: y-intercept $(0, c)$, initial value

$a > 0$ upward pointing parabola

$a < 0$ downward pointing parabola

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intercepts: y-int: set $x = 0$ $(0, f(0))$

x-int: Set $y = 0$ and solve:

Exact → ★ 1.) Factor (if doesn't factor nicely, do 2.)

Exact → ★ 2.) Quad Formula:

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

3.) Only for approximations!

Use calc to find intercepts.

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vertex: $a > 0$ up ∨ min value of k occurring @ $x = h$

$a < 0$ down ∧ max val of k occuring @ $x = h$.

To find vertex:

Exact → ★ 1.) complete the square to find standard form.

Exact → ★ 2.) vertex formula: $h = -b/2a$; $k = f(-b/2a)$

Exact → ★ 3.) midpoint horiz b/t x ints. SYMMETRY: $h =$ (average of x ints), $k = f($)

4.) FOR APPROXIMATION ONLY:

Use calculator and 2nd + trace : max/min.

Example: Find the intercepts, vertex, and sketch a graph.

(a) $y = 2x^2 + 8x + 1$

yint: $(0, 1)$

xint: $0 = 2x^2 + 8x + 1$

QF. $x = \dfrac{-8 \pm \sqrt{64 - 8}}{4}$

$= \dfrac{-8 \pm \sqrt{50}}{4}$

$= \dfrac{-4 \pm \sqrt{14}}{2}$

$x \approx -0.1292, -3.8708$

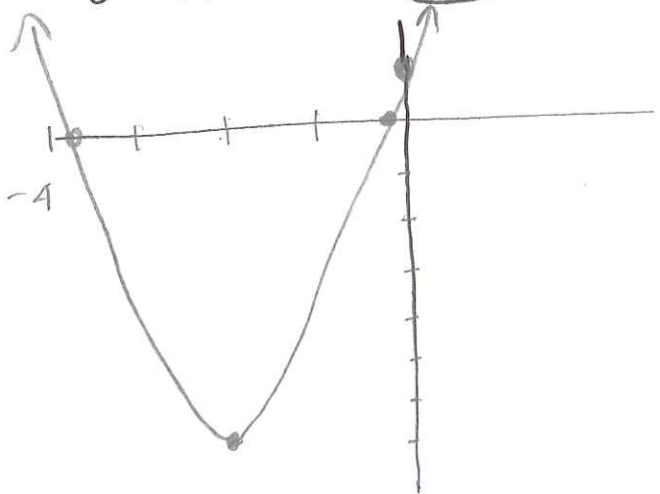
vertex:

$h = -b/2a = -8/2(2) = -2$

$k = 2(-2)^2 + 8(-2) + 1$

$= 8 - 16 + 1 = -7$

$(-2, -7)$



(b) $y = (2x-1)(12-3x)$ $a = -6$ ✓

y int: Set $x=0$: $(-1)(12) = -12$ $(0, -12)$

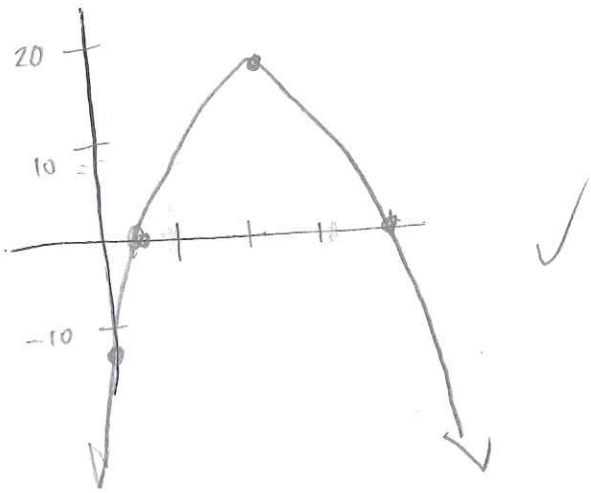
x int: Set $y=0$: $0 = (2x-1)(12-3x)$

$x = \frac{1}{2}, 4$

vertex: h = in blt $x = \frac{1}{2}, x = 4$ $= \frac{4+0.5}{2} = 2.25 = \frac{9}{4}$

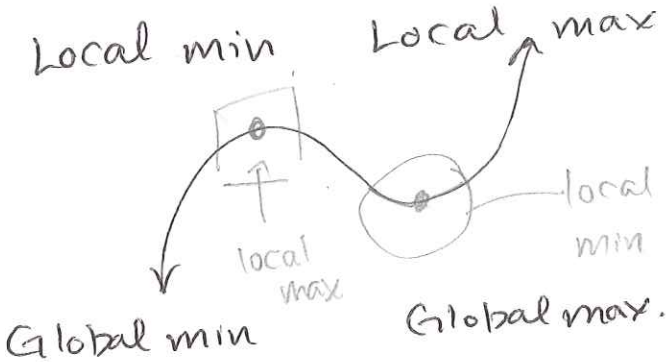
$k = f(\frac{9}{4}) = 18.375 = \frac{147}{8}$

$(\frac{9}{4}, \frac{147}{8})$

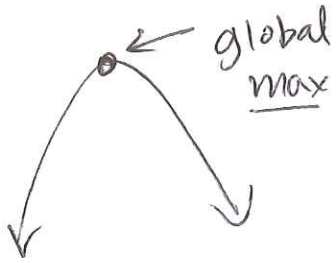


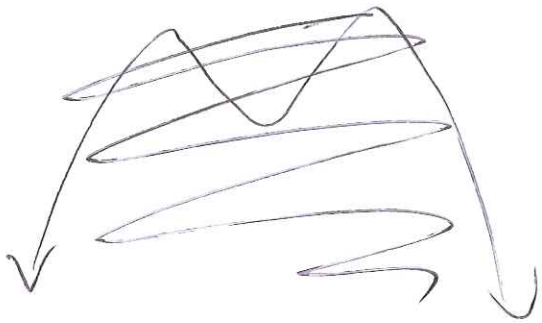
✓

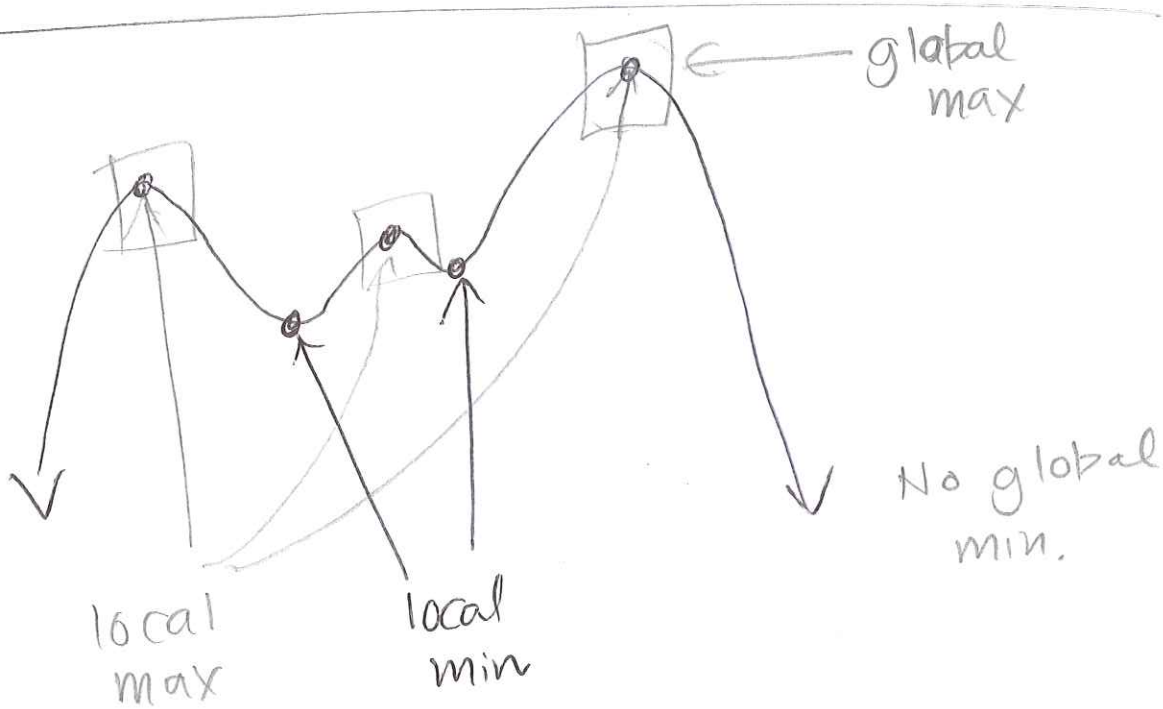
Concept: Local min Local max



← no global min
no global max
(b/c y-values go ±∞!)







In general, no cool method before calc to find max/mins exactly unless graph is quadratic.

Next Best thing, is approximate using graph.

#202 #61.) $R(x) = \overset{b}{80}x - \overset{a}{0.4}x^2$

revenue in $ ← R(x)

x ↑ # of items

max revenue? know max exists since quadratic and $a = -0.4 < 0$.

# of items?

vertex: $h = -b/2a = +80/2(+0.4) = 100$ items.

$k = R(100) = 80(100) - 0.4(100)^2 = \$4{,}000$

We maximize revenue when producing 100 items.
The max rev is $4,000.

#63.) Find n so that $E(n)$ is maximized.

$E(n) = \overset{b}{\frac{2}{3}}n - \overset{a}{\frac{1}{90}}n^2$.

$\Rightarrow$ quadratic and $a = -\frac{1}{90} < 0 \Rightarrow$ max occurs @ vertex.

$h = \frac{-b}{2a} = \frac{+\frac{2}{3}}{2(+\frac{1}{90})} = \frac{2}{3} \cdot \frac{90}{2} =$ 30 viewings

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#67.) $N(s) = \frac{885}{17 + 17(\frac{s}{20})^2}$ ← speed

N(s) ↑ # of cars

speed

Find speed to max # of cars travelling safely.

Not quadratic $\Rightarrow$ calculator approx.

s = 20 units

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2/10/11

2.4 Hw

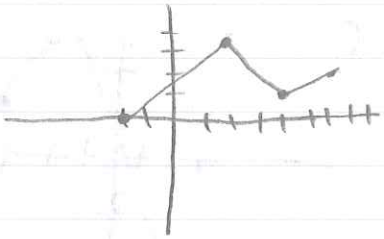
3, 10, 11, 19, 20, 25, 43, 48, 54, 65, 70, 74.

3. a- shifted left 1/2
b. shifted up 1/2

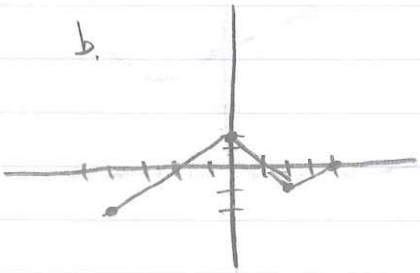
10. a. flipped over x-axis then shrink H by a 1/2
b. shrink H by 1/2 then shift down 1.

11. $f(x) = x^2$
$f(x) = (x-2)^2$

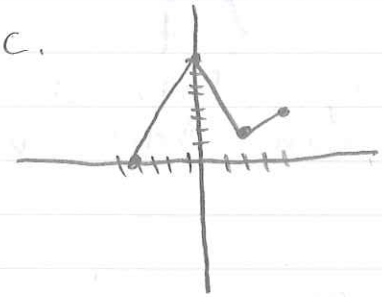
19. a.



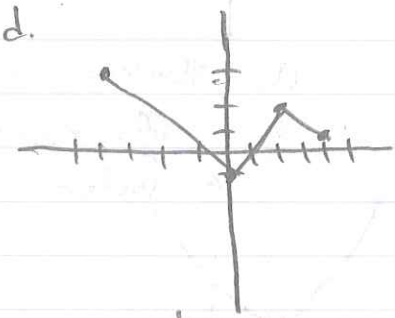
b.



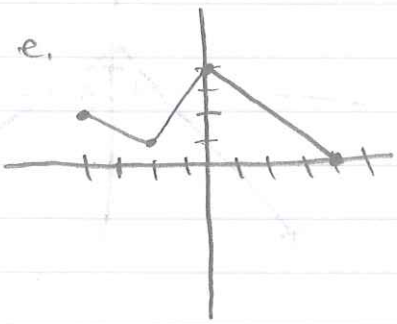
c.



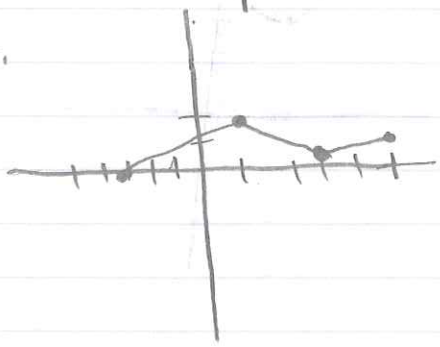
d.



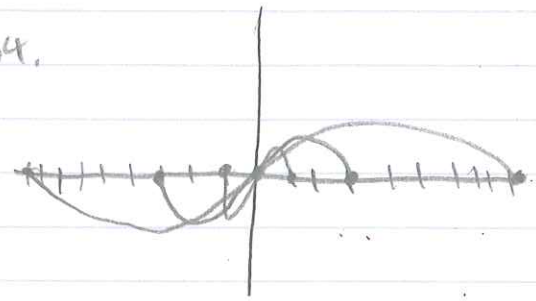
e.



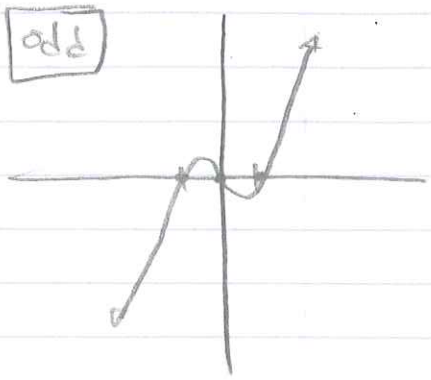
f.



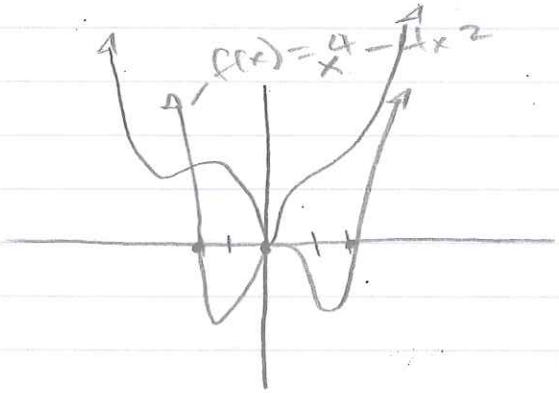
54.



65. odd



70.



74. ?