Theta Division - Functions Test

1. [C] Use cubic regression on graphing calculator

$y = .3x^3 + .2x^2 + .2x - .3$

$y(11) = 425.4$ thousands

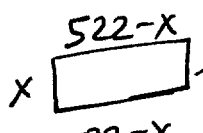
2. [C] $R = 100x - .05x^2$ (graph and look at vertex)

or

$x = \frac{-b}{2a} = \frac{-100}{2(-.05)} = \frac{-100}{-.1} = 1000$

When $x = 1000$, $R = 50000$

3. [D]



$A = x(522-x) = 522x - x^2$

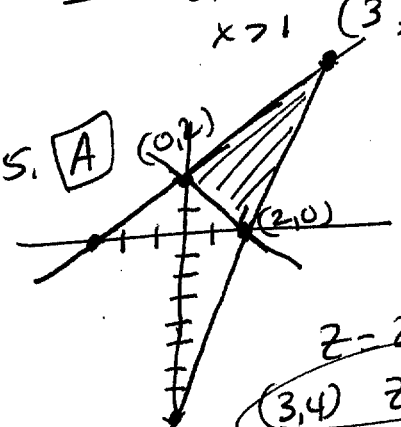
vertex $= \frac{-522}{-2} = 261$

$x = 261$,

4. [A] $3x - 3 > 0$

$3x > 3$

$x > 1$



$-2x + 3y = 6$

$4x - y = 8$

$-4x + 6y = 12$

$4x - y = 8$

$5y = 20$

$y = 4$

$x = 3$

5. [A]

$z = 26x + 11y$

(3,4) $z = 122$

(2,0) $z = 52$

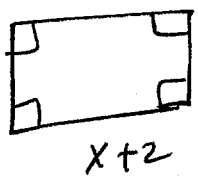
(0,2) $z = 22$

6. [D] $4^{x+2} - 4^{x+1} + 4^x = 4^x(4^2 - 4 + 1) = 4^x(13)$

7. (A) $f(g(x)) = \frac{4}{2x-1}$ $\quad g(f(x)) = \frac{8}{x-1}$

$$\frac{4}{2x-1} = \frac{8}{x-1}$$
$$4x-4 = 16x-8$$
$$4 = 12x$$
$$\tfrac{1}{3} = x$$

8. (B)



$$4(x-8)(x+2-8) = 672$$
$$4(x-8)(x-6) = 672$$
$$4(x^2-14x+48) = 672$$

$$x^2-14x+48 = 168$$
$$x^2-14x-120 = 0$$
$$(x-20)(x+6) = 0$$
$$x = 20, \cancel{-6}$$

20 by 22

9. (C)

$$\begin{array}{c|cccc} 2 & 1 & b & -13 & 10 \\ & & 2 & 2b+4 & 4b-18 \\ \hline & 1 & b+2 & 2b-9 & 4b-8 \end{array}$$

$$4b-8 = 0$$
$$b = 2$$

10. (B) Slope of 1st line: $-\frac{1}{2}$

Slope of 2nd line: $-\frac{a}{3}$

$$-\frac{a}{3} = 2 \qquad -a = 6 \qquad a = -6$$

11. (C) $a(-2) = -661$

12. (A) $c(e) = 3e-2$ $\quad b(3e-2) = 2(3e-2)^2 - 4(3e-2) + 1 = 52.144$

13. (D) r value of vertex $= \frac{-\frac{9}{4}}{-\frac{2}{3}} = -\frac{9}{4} \cdot \frac{-3}{2} = \frac{27}{8}$

$c\left(\frac{27}{8}\right) = 1.797$

14. $\frac{3x-5}{(x-3)(x-2)} = \frac{m}{x-3} + \frac{h}{x-2} = \frac{m(x-2)+h(x-3)}{(x-3)(x-2)}$

(C)

$3x-5 = mx-2m+hx-3h$

$3 = m+h$

$3-h = m$

$-5 = -2m-3h$

$-5 = -2(3-h)-3h$

$-5 = -6+2h-3h$

$-5 = -6-h$

$h = -1$

$m = 4$

$= \frac{4}{x-3} - \frac{1}{x-2}$

Thus, $2a = 1$ and $b = 4$

$a = \frac{1}{2}$

$-a^2 = -\left(\frac{1}{2}\right)^2 = -\frac{1}{4}$ (C)

15. II is odd, IV is odd

(D)

16. $y = \frac{2x-3}{4x+2} + 4$

(D) $y = \frac{2x-3+16x+8}{4x+2} = \frac{18x+5}{4x+2}$

Switch x and y and solve for y

$x = \frac{18y+5}{4y+2}$

$4xy+2x = 18y+5$

$4xy-18y = -2x+5$

$y(4x-18) = -2x+5$

$y = \frac{-2x+5}{4x-18}$

17. $ax^2+5x-6=a$

(A) $ax^2+5x-6-a=0$

$b^2-4ac<0$

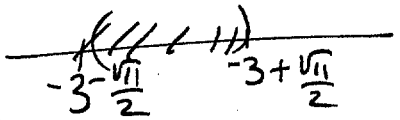
$25-4a(-6-a)<0$

$25+24a+4a^2<0$

$4a^2+24a+25<0$

$-24\pm\sqrt{576-4(4)(25)}$

$\frac{-24\pm\sqrt{176}}{8} = \frac{-24\pm 4\sqrt{11}}{8} = -3\pm\frac{\sqrt{11}}{2}$



18. (B) $\frac{x^2(x-3)-3(x-3)}{(x-3)(x+3)} = \frac{(x^2-3)(x-3)}{(x-3)(x+3)}$ VA at $x=-3$

Slant asymptote: $y=x-3$

$-3)\ 1\ 0\ -3\ 9$

$1\ -3\ 0$

19. (B) $4=A+B+C$ (plugging in $x=4,\ y=1$)

20. (B) If odd function contains (x,y) then it also contains $(-x,-y)$. Thus contains $(1,2)$ $(3,5)$ $(-5,-1)$ also $(-1,-2)$ $(-3,-5)$ $(5,1)$

$B(B(B(-3))) = B(B(-5)) = B(-1) = -2$

21. (A) $\frac{-K}{A} = \frac{9}{3} = 3$

22. (C) $9x-39<90$

$9x<133$

$x<14.777$

$1, 2, 3, \ldots 14$

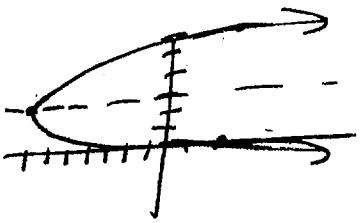
fourteen

$\frac{8!}{2!} = 20160$

23. $x = y^2 - 6y + 2$

(B) $y = \frac{6}{2} = 3$

$x = 9 - 18 + 2 = -7$



vertex $(-7, 3)$

$y = 3$

24. [A] Costs = $.60(20) + .72(10) + x(.40) = 12 + 7.2 + .4x = 19.2 + .4x$

Total Selling Price = $.60(20 + 10 + x) = .6(30 + x) = 18 + .6x$

Profit = Total Revenue − Total cost = $\frac{1}{14}$(cost)

$18 + .6x - (19.2) + .4x) = \frac{1}{14}(19.2 + .4x)$

$18 + .6x = \frac{15}{14}(19.2 + .4x)$

$252 + 8.4x = 288 + 6x$

$2.4x = 36$

$x = 15$

25. Roots are:

[A]

$$\frac{p \pm \sqrt{p^2 - 4(1)(p^2 - 1)}}{2} = \frac{p \pm \sqrt{1}}{2} = \frac{p+1}{2}, \frac{p-1}{2}$$

$$\frac{p+1}{2} - \frac{p-1}{2} = \frac{p}{2} + \frac{1}{2} - \frac{p}{2} + \frac{1}{2} = [1]$$

Tiebreaker: $(x^2 - 5x + 5)^{x^2 - 9x + 20} = 1$ $\quad$ 1, 2, 3, 4, 5

If $x^2 - 9x + 20 = 0$ $\quad x = 4, 5$

If $x^2 - 5x + 5 = 1$, then $x^2 - 5x + 4 = 0$ $\quad x = 4, 1$

If $x^2 - 5x + 5 = -1$ and $x^2 - 9x + 20$ is even

$x^2 - 5x + 6$

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

$x = 3$, and $x^2 - 9x + 20$ is even

$x = 2$ and $x^2 - 9x + 20$ is even