Honors PreCalculus 2020-21
PreCalc Basics Test

Name: Solution Key

score_____

1. Use a graphing utility to determine the *number* of real solutions to the equation $4x^3 - 10x + 17 = 0$.

a) 0 b) 1 c) 2 d) 3 e) 4

2. $y = x^3 + 18x - 35$ has a zero in the interval

a) (0, 0.5) b) (0.5, 1) c) (1, 1.5) d) (1.5, 2) e) (2, 2.5)

3. For what value(s) of k is $x^2 + 3x + k$ divisible by $x + k$?

a) only 0
b) only 0 or 2
c) only 0 or –4
d) no value of k
e) any value of k

$-k$ | 1 3 k
$-k$ $-3k+k^2$
1 $(3-k)$ $k^2-2k=0$
$k=0, 2$

4. Find an equation for the line perpendicular to $y = 2x - 4$ that contains the point $(0, 3)$.

$m = -1/2$

a) $y = -0.5x + 3$ b) $y = \frac{1}{2}x + 3$ c) $y = \frac{1}{3}x - 2$

d) $y = -\frac{1}{2}x - 4$ e) $2y - x = 6$

Given this sign pattern $\begin{array}{c} f(x) \\ x \end{array}$ $\overset{\longleftarrow}{-\quad 0 \quad + \quad 0 \quad - \quad 0 \quad -\longrightarrow}$ $\begin{array}{ccc} & & \\ -4 & -1 & 2 \end{array}$, which of the following **might** be the equation of $f(x)$?

$(x-2)^2$

a) $f(x)=(x+4)(x+1)(x-2)$
b) $f(x)=-(x+4)(x+1)(x-2)$
c) $f(x)=-(x+4)(x+1)^2(x-2)$
d) $f(x)=-(x+4)(x+1)^2(x-2)^2$
e) $f(x)=-(x+4)^3(x+1)(x-2)^4$

6. Find the remainder when x^3-6x^2+5x-2 is divided by $x-6$.

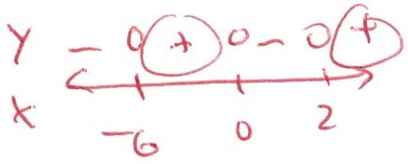
a) -2 b) 32 c) 464 d) 28 e) None of these

$$\begin{array}{r|cccc} 6 & 1 & -6 & 5 & -2 \\ & & 6 & 0 & 30 \\ \hline & 1 & 0 & 5 & 28 \end{array}$$

7. Solve the inequality $x^3+4x^2-12x \geq 0$.

$x(x+6)(x-2) \geq 0$

a) $x \in [-6, 0]$
b) $x \in [2, \infty)$
c) $x \in [0, 2]$
d) $x \in [-6, 0] \cup [2, \infty)$
e) $x \in [-6, 0) \cup (0, 2]$



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Round to 3 decimal places. **score**_____

Show all work.

1. Use your graphing calculator to find **and sketch** a complete graph of $f(x)=-x^4-10x^3+5x^2+12x+1$. State the window used, find the zeros, and the extreme points.

Window: $x \in [-12, 5]$ $y \in [-100, 1300]$

Zeros: $(-10.391, 0)$ $(-.848, 0)$ $(-.087, 0)$ $(1.306, 0)$

Extreme Points:

$(-7.772, 1255.712)$

$(-.5, -2.563)$

$(.772, 8.288)$

2. Find the zeros of $y=-3x^4-11x^3+32x^2+44x-80$ by calculator and prove it by synthetic division.

2 | -3 -11 32 44 -80

-6 -34 -4 80

-3 -17 -2 40 0

-2 | -3 -17 -2 40

6 22 -40

-3 -11 20 0

$(\pm 2, 0)$

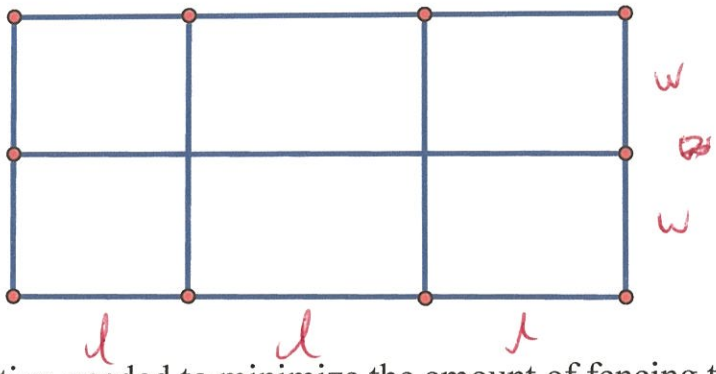
$(-5, 0)$

$\left(\frac{4}{3}, 0\right)$

$(x-2)(x+2)(-3x^2-11x+20)$

$x = \frac{11 \pm \sqrt{121+4(3)(20)}}{-6} = \begin{cases} -5 \\ 4/3 \end{cases}$

3. A 4000 square-foot field is surrounded and divided into six equal parts by a fence.



a. State the equation needed to minimize the amount of fencing to be used.

$F = 4l + 8w$

b. State the secondary equation needed to eliminate the extra variable.

$3w \cdot 3l = 6lw = 4000 \rightarrow l = \frac{2000}{3w}$

c. Eliminate the extra variable in the equation needed to minimize the amount of fencing.

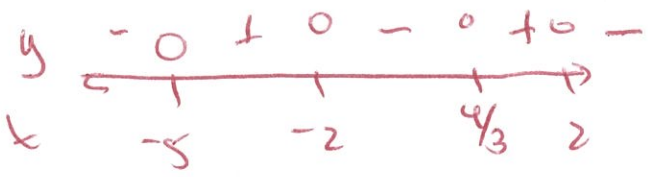
$F = \frac{8000}{w} + 8w$

d. Find the minimum amount of fencing.

(27.386, 438.179)

MIN FENCE = 438.179'

7. Show the sign pattern and solve $-3x^4-11x^3+32x^2+44x-80<0$. (Note: This is the polynomial from #2 above)

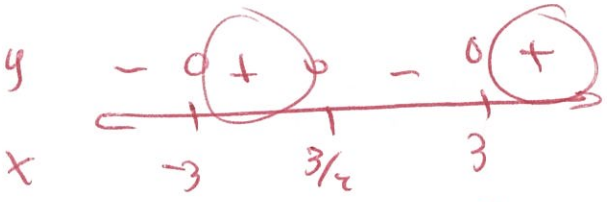


$x \in (-\infty, -5) \cup (-2, 4/3) \cup (2, \infty)$

8. Show the sign pattern and solve $4x^3-3x^2-36x+27\geq 0$

$x^2(4x-3)-9(4x-3)\geq 0$

$(x^2-9)(4x-3)\geq 0$



$x \in [-3, 3/4] \cup [3, \infty)$

4. Use synthetic division to find $f\left(-\frac{1}{3}\right)$ if $f(x)=9x^3-7x+3$.

$$\begin{array}{r|rrrr} -\frac{1}{3} & 9 & 0 & -7 & 3 \\ & & -3 & 1 & 2 \\ \hline & 9 & -3 & -6 & 5 \end{array}$$

$f\left(\frac{-1}{3}\right)=5$

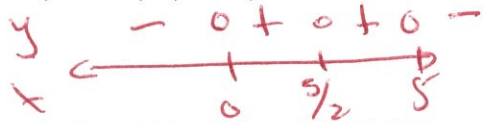
5. Find an inequality that has this sign pattern and solution:

$$\begin{array}{cc} y & +0\ -\ 0\ -\ 0\ + \\ x & -4 \qquad \frac{2}{3} \qquad 2 \end{array} \quad \text{and} \quad x\in(-\infty,-4]\cup\left\{\frac{2}{3}\right\}\cup[2,\infty)$$

$(x+4)(3x-2)^2(x-2)\geq 0$

6. Show the sign patterns for

$y=-4x(2x-5)^6(x-5)^3$



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