Honors PreCalculus 2017-18 **Name:** Solution Key

PreCalc Basics Test

score 160

1. If $f(x)$ is a linear function $f(3)=16$ and $f(1)=10$, then the equation of the line is

$m = \frac{16-10}{3-1} = 3$

(a) $f(x)=\frac{1}{3}x+4$

(b) $f(x)=2x+10$

(c) $f(x)=\frac{1}{2}x+4$

(d) $f(x)=-\frac{1}{2}x+10$

(e) $f(x)=3x+7$

2. An equation for the line through the point $(0,4)$ and parallel to the line with the equation $3x-y=6$ is

$m = 3$

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

$3x-y = -4$

(a) $y=-3x+4$

(b) $y=4x$

(c) $y=3x+4$

(d) $y=-\frac{1}{3}x+4$

(e) $y=3x$

3. Find the vertex of the parabola $-5x^2-40x+y-78=0$.

$-5(x^2+8x+16)-78+80=0$

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

$(-4,-2)$

(a) $(-4,2)$

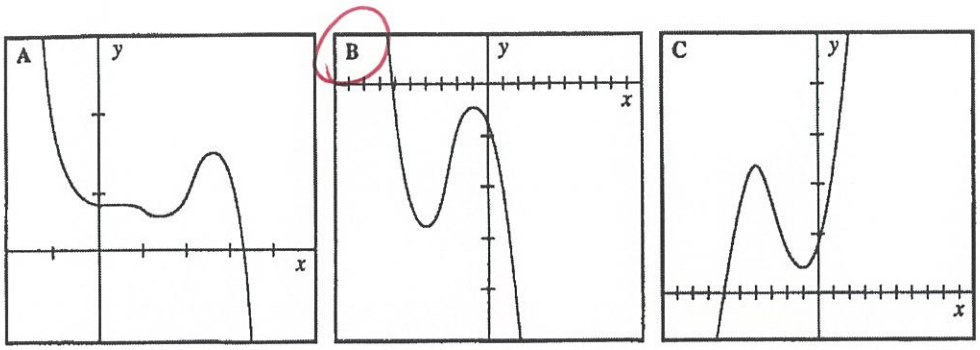
(b) $(-2,-4)$

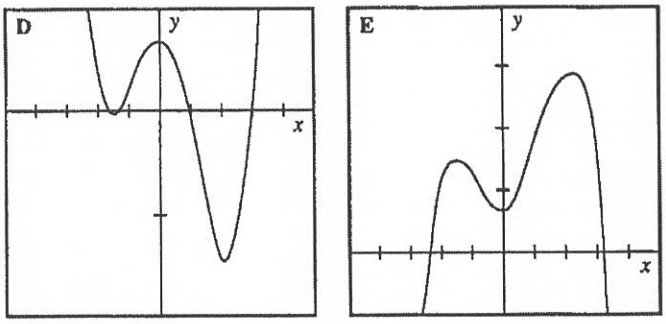
(c) $(-4,-2)$

(d) $(2,-4)$

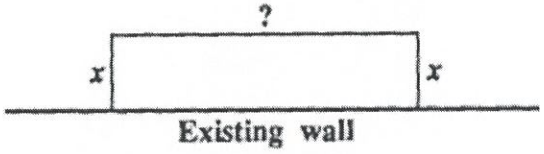
(e) $(4,2)$

4. Which one of the following could represent a complete graph of $f(x) = -x^3 + px^2 + qx + r$ where p, q, and r are real numbers?





5. Three sides of a fence and an existing wall form a rectangular enclosure. The *total* length of fence used is 180 feet. Let x be the length of the two sides perpendicular to the wall.



What possible x-values make sense in this problem?

$0 < x < 90$

(a) $x > 0$
(b) $0 < x < 180$
(c) $0 < x < 80$
(d) $x < 180$
(e) None of these

6. Given this sign pattern

$f(x)$	$-$	0	$+$	0	$-$	0	$-$
x		-4		-1		2	

, which of the following **might** be the equation of $f(x)$?

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

7. Solve $3x^2-5x<2$.

$3x^2-5x-2<0$

$(3x+1)(x-2)$

y	+	0		−		0	+
x		$-1/3$				2	

(a) $x<-\frac{1}{3}$ or $2<x$

(b) $-\frac{1}{3}<x<2$

(c) $x<-2$ or $\frac{1}{3}<x$

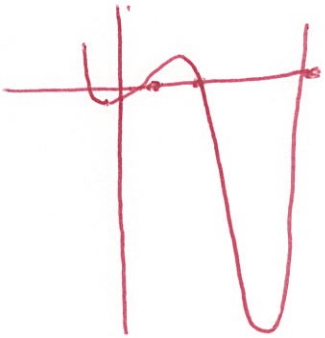
(d) $-2<x<\frac{1}{3}$

(e) $-\frac{2}{3}<x<1$

Honors Precalculus '17-18 **Name:** Solution Key
PreCalc Basics Test
Round to 3 decimal places. **score**_____
Show all work.

1. Use your graphing calculator to find **and sketch** a complete graph of $f(x)=x^4-21x^3+43x^2-14x-8$. State the window used, find the zeros, and the extreme points.

Window: $x\in[-5,20]\cup y\in[-12000,1000]$



Zeros: $(-.286,0)$ $(.428,0)$ $(1.610,0)$
$(18.748,0)$

Extreme Points:
$(.189,-9.251)$
$(1.302,3.189)$
$(14.259,-11007.92)$

2. Find the zeros of $y=-3x^4-19x^3-25x^2+19x+28$ by calculator and prove it by synthetic division.

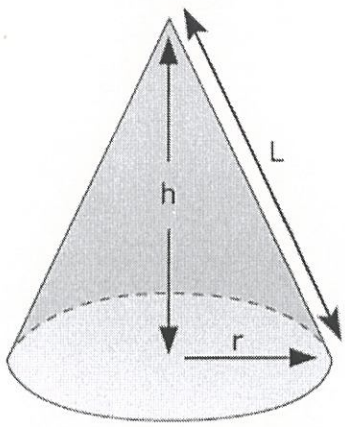
$$\begin{array}{r|rrrrr} -4 & -3 & -19 & -25 & 19 & 28 \\ & & 12 & 28 & -12 & -28 \\ \hline & -3 & -7 & 3 & 7 & \end{array}$$

$(x+4)(-3x^3-7x^2+3x+7)$

$(x+4)(-3x-7)(x^2-1)$

Zeros: $(-4,0)$, $(\pm1,0)$, $(-7/3,0)$

3. The volume of a right circular cone is given by $V = \frac{1}{3}\pi r^2 h$ and the surface area is given by $A = \pi r^2 + \pi r l$. Given that r, h, and l form a right triangle, what equation would you put in your calculator to find the radius which would determine the maximum volume of a cone with surface area = 100π cm^2?



$V = \frac{1}{3}\pi r^2 h$

$100\pi = \pi r^2 + \pi r l$

$l = \frac{100 - r^2}{r}$

$h^2 + r^2 = l^2$

$h = \sqrt{l^2 - r^2}$

$= \sqrt{\left(\frac{100 - r^2}{r}\right)^2 - r^2}$

$V = \frac{\pi}{3} r^2 \sqrt{\left(\frac{100 - r^2}{r}\right)^2 - r^2}$

4. Use synthetic division to find $f\left(-\frac{1}{2}\right)$ if $f(x) = 8x^3 - 4x + 3$.

$-\frac{1}{2}$	8	0	-4	3
		-4	2	1
	8	-4	-2	4

$f(-\frac{1}{2}) = 4$

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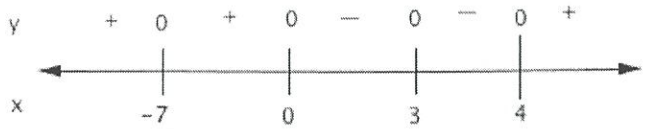
NO CALCULATOR ALLOWED
Show all work.

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



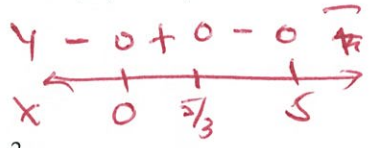
$x \in (-\infty, 0] \cup \{3\} \cup [4, \infty)$

POSITIVES & ZEROS

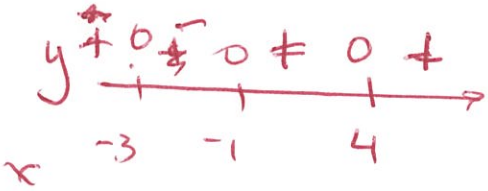
$x(x+7)^2(x-3)^2(x-4) \geq 0$

6. Show the sign patterns for

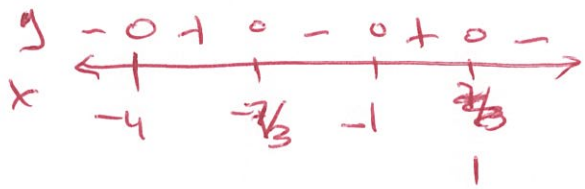
$y = -2x(3x-5)^3(x-5)^2$



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



7. Show the sign pattern and solve $-3x^4-19x^3-25x^2+19x+28<0$. (Note: This is the polynomial from #2 above)

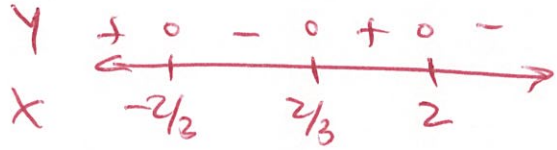


$x \in (-\infty, -4) \cup (-7/3, -1) \cup (1, \infty)$

8. Show the sign pattern and solve $-9x^3+18x^2+4x-8>0$

$-9x^2(x-2)+4(x-2)>0$

$(4-9x^2)(x-2)>0$



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