

1. If $f(x)$ is a linear function $f(2)=1$ and $f(4)=-2$, then $f(x)=$

(a) $f(x) = -\frac{3}{2}x + 4$

(b) $f(x) = \frac{3}{2}x - 2$

(c) $f(x) = -\frac{3}{2}x + 2$

(d) $f(x) = \frac{3}{2}x - 4$

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

$$m = \frac{1 - (-2)}{2 - 4} = \frac{3}{-2}$$

$$y - 1 = -\frac{3}{2}(x - 2)$$

$$y - 1 = -3x + 3$$

2. An equation for the line through the point $(1, -2)$ and parallel to the line with the equation $3x - 2y = 5$ is

(a) $3x - 2y = 7$

(b) $x - 2y = -3$

(c) $3x + 2y = 1$

(d) $2x + 3y = -4$

(e) $2x + 3y = -8$

$$3x - 2y = 3(1) - 2(-2) = 7$$

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

(a) $(-4, 2)$

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

(c) $(4, -2)$

(d) $(2, -4)$

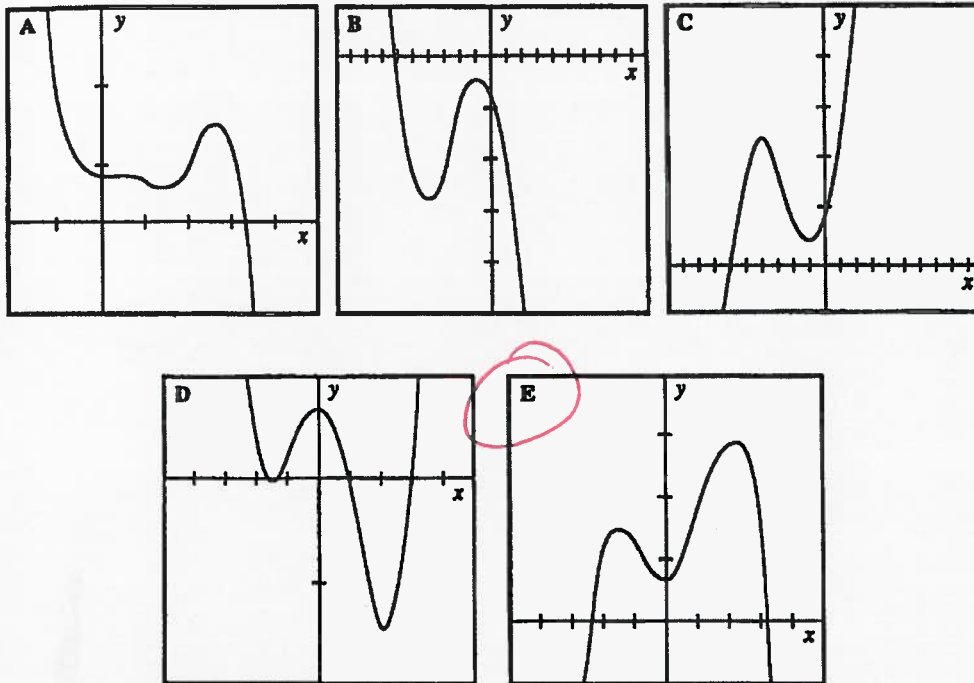
(e) $(4, 2)$

$$5(x^2 - 8x)$$

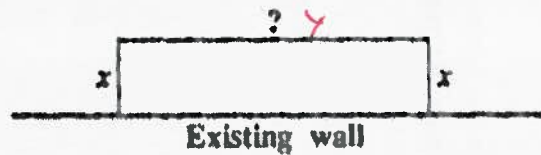
$$(x - 4)^2$$

$$x = 4 \rightarrow y = -2$$

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



5. Write the area A of the enclosure as a function of the length x of the rectangular area as shown in the figure below. *TOTAL LENGTH OF FENCE = 160'*



$$2x + y = 160$$

$$y = 160 - 2x$$

$$A = xy$$

- (a) $A(x) = 160 - 2x^2$
- (b) $A(x) = 160x$
- (c) $A(x) = 2x + 80$
- (d) $A(x) = 80x - 2x^2$
- (e) $A(x) = 160x - 2x^2$**

6. Find the polynomial of degree 3 whose zeros are $(-3, 0)$, $(\frac{3}{2}, 0)$ and $(2, 0)$.

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

~~$$x^2 + x - 6$$~~

$$2x - 3$$

$$2x^3 + 2x^2 - 12x$$

$$-3x^2 - 3x + 18$$

$$2x^3 - x^2 - 15x + 18$$

(a) $f(x) = 2x^3 - x^2 - 15x - 18$

(b) $f(x) = 2x^2 + 3x - 9$

(c) $f(x) = 2x^2 - 7x + 6$

(d) $f(x) = 2x^3 - x^2 - 15x + 18$

(e) $f(x) = 2x^3 - 7x^2 - 15x + 18$

7. Determine the sign pattern for $f(x) = 2x^4 - 2x^3 - 4x^2$.

(a)
$$\begin{array}{c} y \\ x \end{array} \begin{array}{cccccc} + & 0 & - & 0 & - & 0 & + \\ \leftarrow & -1 & & 0 & & 2 & \rightarrow \end{array}$$

(b)
$$\begin{array}{c} y \\ x \end{array} \begin{array}{cccccc} - & 0 & + & 0 & - & 0 & + \\ \leftarrow & -1 & & 0 & & 2 & \rightarrow \end{array}$$

~~(c)~~
$$\begin{array}{c} y \\ x \end{array} \begin{array}{cccccc} + & 0 & - & 0 & + & 0 & - \\ \leftarrow & -1 & & 0 & & 2 & \rightarrow \end{array}$$

~~(d)~~
$$\begin{array}{c} y \\ x \end{array} \begin{array}{cccccc} - & 0 & + & 0 & + & 0 & - \\ \leftarrow & -1 & & 0 & & 2 & \rightarrow \end{array}$$

(e)
$$\begin{array}{c} y \\ x \end{array} \begin{array}{cccccc} + & 0 & + & 0 & + & 0 & + \\ \leftarrow & -1 & & 0 & & 2 & \rightarrow \end{array}$$

$$2x^2(x^2 - x - 2) = 2x^2(x-2)(x+1)$$

NO SIGN CHANGE

SIGN CHANGES

SIGN ON RIGHT IS +

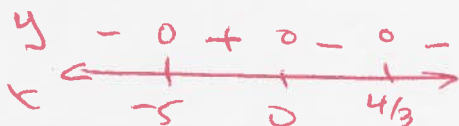
Honors Precalculus '15-16
 PreCalc Basics
 Round to 3 decimal places.
 Show all work.

Name: SOLUTION KEY

score _____

1. Show the sign patterns for

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



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



2. Find the zeros of $y = 3x^4 + 11x^3 + 11x^2 + 55x - 20$ by calculator and prove it by synthetic division.

$$\begin{array}{r|rrrrrr} -4 & 3 & 11 & 11 & 55 & -20 \\ & & -12 & 4 & -60 & 20 \\ \hline & 3 & -1 & 15 & -5 & 0 \end{array}$$

$$(x+4)(3x^3 - x^2 + 15x - 5)$$

$$(x+4) [\cancel{3x^2} x^2(3x-1) + 5(3x-1)]$$

$$(x+4)(3x-1)(x^2+5)$$

$$\begin{aligned} &(-4, 0) \\ &(1/3, 0) \end{aligned}$$

3. 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: $x \in [-15, 10]$ $y \in [-300, 1300]$

Zeros: $(-10.371, 0)$ $(-0.848, 0)$ $(1.306, 0)$
 $(-0.087, 0)$

Extreme Points:

$(-7.772, 1252.12)$

$(1.782, 8.28)$

$(-1.5, -0.2563)$



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

$$\begin{array}{r|rrrr}
 -\frac{1}{3} & 9 & 0 & -7 & 3 \\
 & & -3 & 7 & -\frac{13}{3} \\
 \hline
 & 9 & -3 & 0 & \frac{13}{3} \\
 & & & & \frac{13}{3} \\
 \hline
 & & & & 5
 \end{array}$$

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

PreCalc Basics

NO CALCULATOR ALLOWED

Show all work.

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

$$\begin{array}{ccccccc} & -0 & + & 0 & + & 0 & - \\ y & & & & & & \\ x & \leftarrow & -2 & & \frac{1}{3} & & 5 & \rightarrow \end{array} \text{ and } x \in (-\infty, -2] \cup \left\{ \frac{1}{3} \right\} \cup [5, \infty)$$

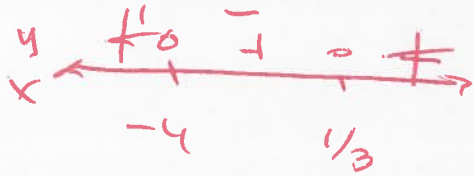
$$-(x+2)(3x-1)^2(x-5) \leq 0$$

6. Simplify the following expression:

$$\begin{aligned} \text{(a)} \quad \frac{x^3 - 2x^2 + 4x - 8}{x^4 - 16} &= \frac{x^2(x-2) + 4(x-2)}{(x^2-4)(x^2+4)} = \frac{(x^2+4)(x-2)}{(x^2+4)(x-2)(x+2)} \\ &= \frac{1}{x+2} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad y &= \frac{x^2 + 5x}{x^2 + 6x + 5} \div \frac{x^3}{3x+3} \cdot \frac{x}{x+1} = \frac{\cancel{x(x+5)}}{(x+5)(x+1)} \cdot \frac{3(x+1)}{\cancel{x^2}} \cdot \frac{\cancel{x}}{x+1} \\ &= \frac{3}{x(x+1)} \end{aligned}$$

7. Show the sign pattern and solve $3x^4 + 11x^3 + 11x^2 + 55x - 20 < 0$. (note: this is the polynomial from #2 above)



$$x \in \cancel{(-\infty, -4)} \cup (1/3, \infty)$$

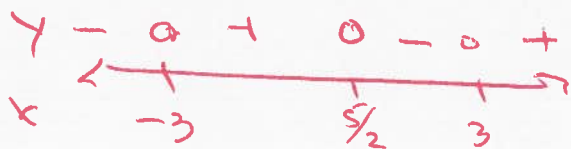
$$x \in (-4, 1/3)$$

8. Show the sign pattern and solve $2x^3 - 5x^2 - 18x + 45 \geq 0$

$$x^2(2x-5) - 9(2x-5) \geq 0$$

$$(x^2-9)(2x-5) \geq 0$$

$$(x-3)(x+3)(2x-5) \geq 0$$



$$x \in [-3, 5/2] \cup [3, \infty)$$