Honors PreCalculus '20-21
Dr. Quattrin
Polynomials Test
CALCULATOR ALLOWED
Round to 3 decimal places.

Name: Solution Key

Score ___________

1. Given this sign pattern

$f'(x)$	−	0	+	0	−	0	−
x		-4		-1		2	

, at what value of x does f has a relative minimum point?

a) -4 b) -1 c) 2 d) -4 and 2 e) -4, -1, and 2

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2. The minimum value of $f(x)=\frac{4}{\sqrt{x}}+3\sqrt{x}$ is

$f' = -2x^{-3/2} + \frac{3}{2}x^{-1/2}$

$= x^{-3/2}\left(-2 + \frac{3}{2}x\right) = 0$

a) $\frac{3}{4}$ b) $\frac{4}{3}$ c) $\frac{19\sqrt{3}}{2}$ d) $4\sqrt{3}$ e) No such value

$x = \frac{4}{3}$

$f(4/3) = 4\sqrt{3}$

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3. Consider a particle moving such that its position is described by the function $x(t) = \frac{t^4}{2} - \frac{t^5}{10}$. When does the particle attain its maximum position?

$x'(t) = 2t^3 - \frac{1}{2}t^4 = t^3\left(2\cancel{t} - \frac{1}{2}t\right) = 0 \rightarrow t = 0, 4$

a) $t = 0$ b) $t = 1$ c) $t = 2$

d) $t = 3$ e) $t = 4$

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4. If g is a differentiable function such that $g(x) < 0$ for all real numbers x and if $f'(x) = (9 - x^2)g(x)$, which of the following is true?

MAX MIN
f': $+$ 0 $-$ 0 $+$
x: -3 3

a) $f(x)$ has a relative maximum at $x = -3$ and a relative minimum at $x = 3$.
b) $f(x)$ has a relative minimum at $x = -3$ and a relative maximum at $x = 3$.
c) $f(x)$ has relative minima at $x = -3$ and $x = 3$.
d) $f(x)$ has relative maxima at $x = -3$ and $x = 3$.
e) It cannot be determined if f has any relative extrema.

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5. The absolute minimum value of $g(x) = -x^3 + 2x^2$ on $[-1,3]$ occurs when x =

$g' = -3x^2 + 4x = x(-3x+4) = 0 \quad x = 0, 4/3$

OR $-1, 3$

a) -1 b) 0 c) $\frac{4}{3}$ d) 2 e) 3

x	$g(x)$
0	0
-1	3
3	-9
4/3	1.185

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6. What are all values of x for which the function $f(x) = 2 - 3x - x^2 + \frac{1}{3}x^3$ is decreasing?

$f'(x) = x^2 - 2x - 3$

a) $-1 < x < 3$
b) $-3 < x < 1$
c) $x < -3$ or $x > 1$
d) $x < -1$ or $x > 3$
e) All real numbers

f': + 0 − 0 +

x: −1, 3

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7. Given this sign pattern $\begin{array}{c} f'(x) \\ x \end{array} \xleftrightarrow[\quad -3 \qquad\qquad 1 \quad]{\; - \; 0 \quad + \quad 0 \; - \;}$, on which interval(s) is $f(x)$ decreasing?

a) $-3 < x < 1$
b) $x < -3$ and $x > 1$
c) $x < -3$
d) $x > 1$
e) It cannot be determined from this sign pattern

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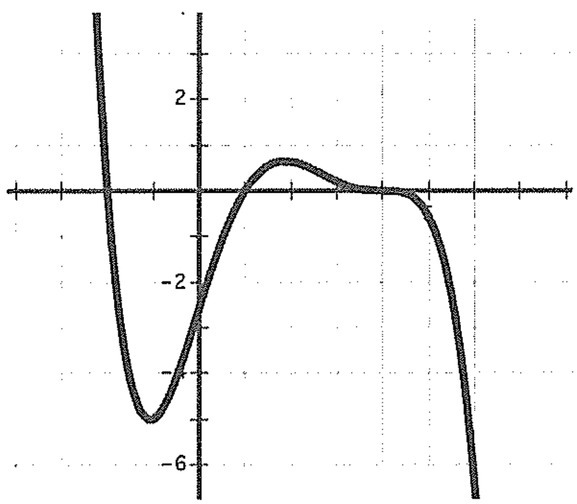
8. Which of the following equations matches this graph:



a) $y = -.07(x+2)(x-1)^3(x-4)$

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

c) $y = -.05(x+2)(x-1)(x-4)^2$

d) $y = -.02(x+2)(x-1)(x-4)^3$

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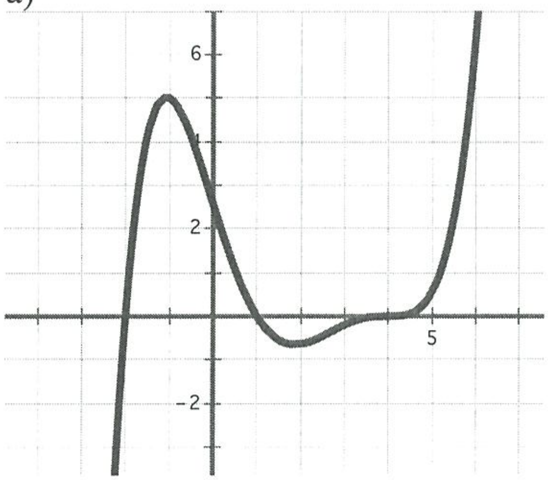
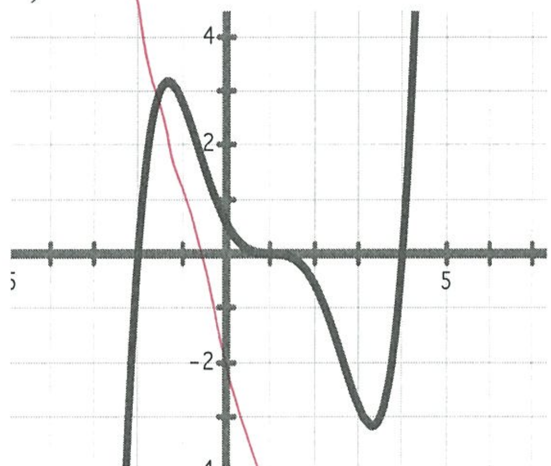
9. Which of the following graphs matches the equation

$$y=.05(x+2)(x-1)(x-4)^2$$

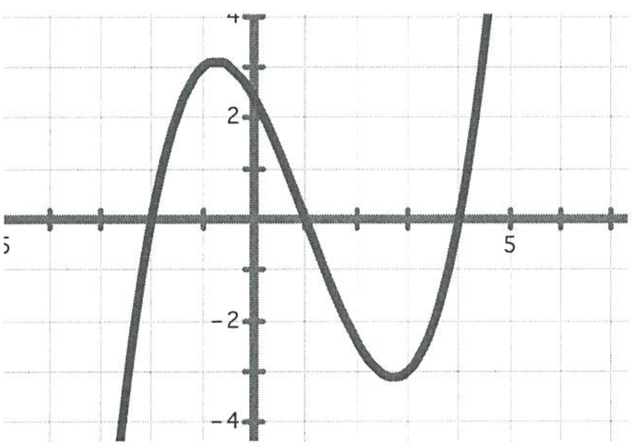
a)



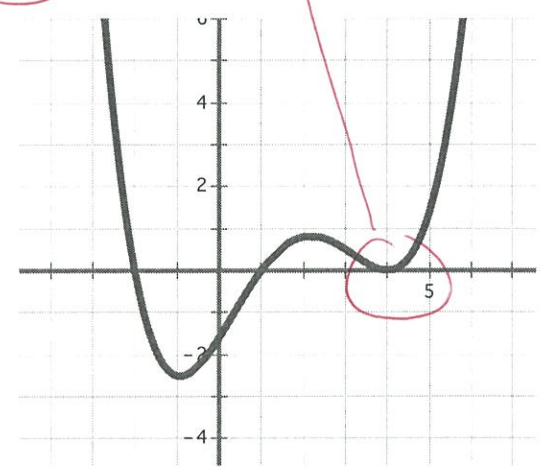
b)



c)



d)



Honors PreCalculus '20-21 Name: Solution Key
Dr. Quattrin
Polynomials Test-- CALCULATOR ALLOWED v2
Round to 3 decimal places. Score ___________
Show all work.

1. Find the zeros and extreme points of $y = -3x^3 + 2x^2 + 147x - 98$. Show the algebraic work to support the zeros and critical values.

Zeros: $y = -x^2(3x-2) + 49(3x-2)$

$= (49 - x^2)(3x-2) = 0$

$x = \pm 7, \frac{2}{3}$

$(\pm 7, 0), (\frac{2}{3}, 0)$

Ext: $\frac{dy}{dx} = -9x^2 + 4x + 147$

$x = \frac{-4 \pm \sqrt{4^2 - 4(-9)(147)}}{2(-9)} = \begin{cases} -3.825 \\ 4.270 \end{cases}$

$(-3.825, -463.127)$

$(4.270, 332.252)$

2. Find the zeros and extreme points of $y = 4x^3 - 12x^2$ on $x \in [-1, 4]$. Show the derivative and algebra to support the critical values.

ZEROS: $4x^2(x-3)$

$(0,0), (3,0)$

EXT: i) $\frac{dy}{dx} = 12x^2 - 24x = 0$

$= 12x(x-2) = 0$

$x = 0, 2$ $(2, -16)$

$x = 0$ IS NOT AN EXT

ii) $\frac{dy}{dx}$ DNE $\rightarrow$ NONE

$(-1, -16)$

iii) END POINTS

$(4, 64)$

3a. Find the zeros, algebraically, of $y = 4 + 8x - x^2 - 2x^3$.

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

$= (4 - x^2)(1+2x) = 0$

$x = \pm 2, -\frac{1}{2}$

$(\pm 2, 0)$ $(-\frac{1}{2}, 0)$

3b. Find the extreme points of $y = 4 + 8x - x^2 - 2x^3$. Show the derivative before using your calculator.

$\frac{dy}{dx} = 8 - 2x - 6x^2 = 0$

$3x^2 + x - 4 = 0$

$(-1.333, -3.704)$

$(1, 9)$

Honors PreCalculus '20-21 Name: SOLUTION KEY

Dr. Quattrin

Polynomials Test—CALCULATOR NOT ALLOWED

Show all work. Score ___________

4. The sign pattern for the derivative of $H(x)$ is given. (a) Is $x = -4$ at a maximum, a minimum, or neither? Why? (b) Is $x = 2$ at a maximum, a minimum, or neither? Why?

$$\begin{array}{c|ccccccc} dH/dx & - & 0 & + & 0 & + & 0 & - \\ x & & -4 & & -1 & & 2 & \end{array}$$

a)

$X = -4$ IS AT A MINUMUM BECAUSE THE SIGN OF $\frac{dH}{dx}$ CHANGES FROM $-$ TO $+$.

b) $X = 2$ IS AT A MAXIMUM BECAUSE SIGN OF $\frac{dH}{dK}$ CHANGES FROM $+$ TO $-$.

7~~5~~. Find the traits and **sketch** $y = 4x^3 - 12x^2$ on $x \in [-1, 4]$.

Domain: $x \in [-1, 4]$

Range: $y \in [16, 64]$

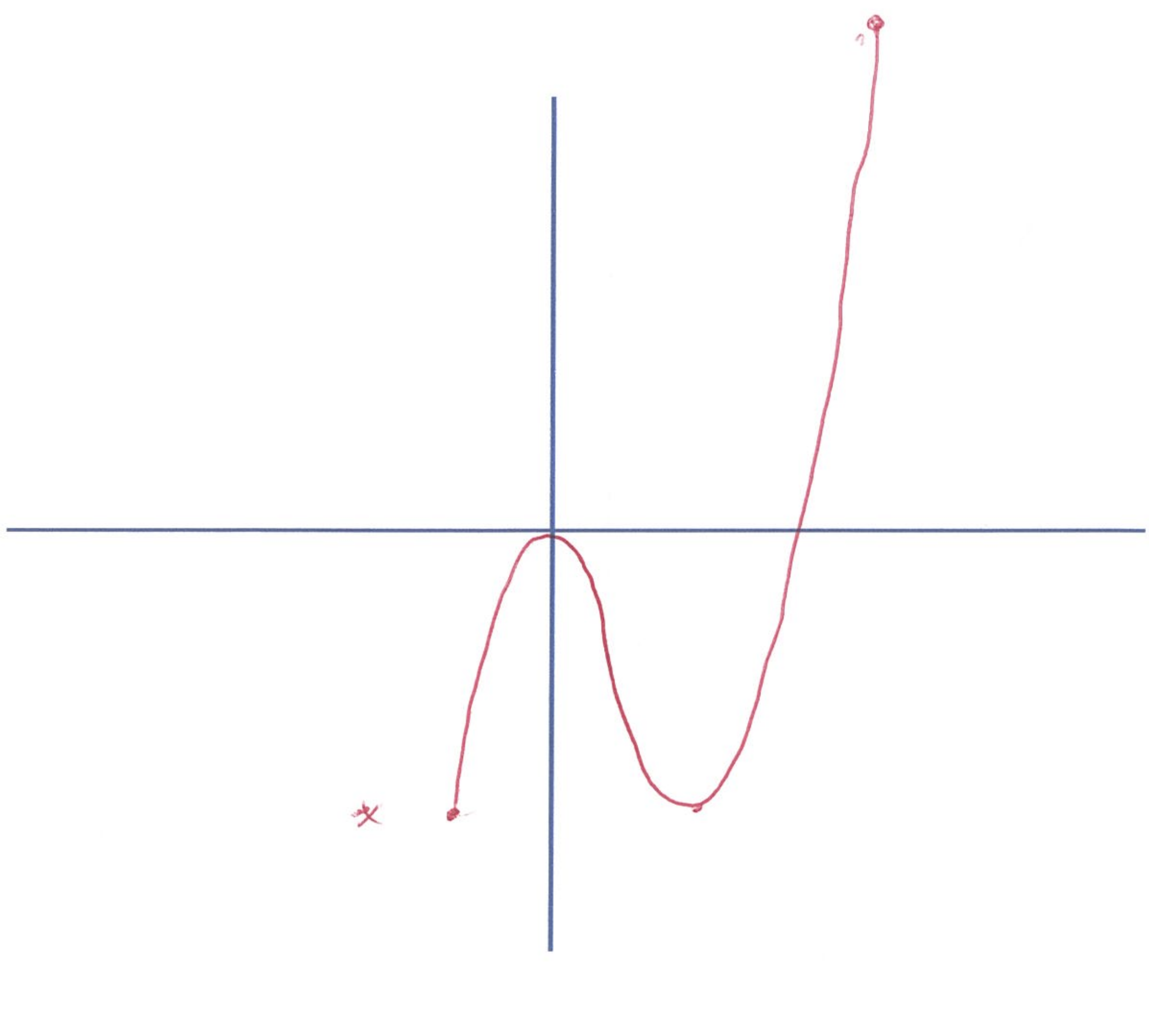
Zeros: $(0, 0)$, $(3, 0)$

Y – Int: $(0, 0)$

End Behavior (left): NONE

End Behavior (right): NONE

Extreme Points: $(2, -16)$ $(4, 64)$ $(-1, -16)$



6. Find the traits and **sketch** of $y = -3x^3 + 2x^2 + 147x - 98$.

Domain: ALL REALS

Range: ALL REALS

Zeros: SEE #1

Y – Int: (0, −98)

End Behavior (left): UP

Extreme Points: SEE #2

End Behavior (right): DOWN