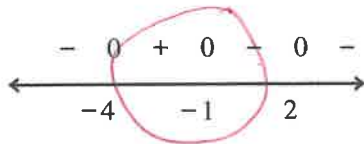
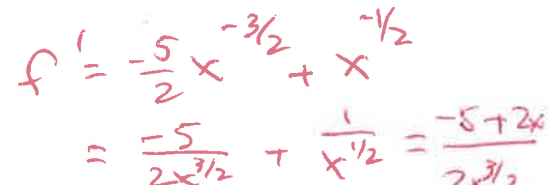
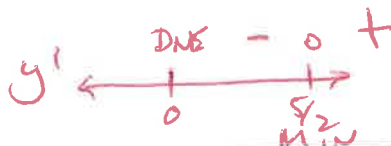


1. Given this sign pattern $f'(x)$ , at what value(s) of x does f has a maximum value?

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

2. The minimum value of $f(x) = \frac{5}{\sqrt{x}} + 2\sqrt{x}$ is 

- a) $\frac{5}{2}$ b) $\frac{2}{5}$ c) $\frac{\sqrt{10}}{5}$ **d) $2\sqrt{10}$** e) No such value



$f' = 0 \rightarrow x = 5/2 \rightarrow y =$
 $f' \text{ DNE} \rightarrow x = 0 \rightarrow y = \text{DNE}$

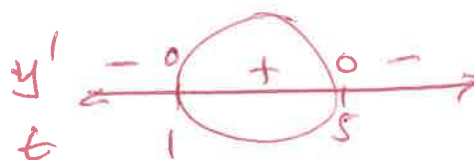
3. On which of the following interval(s) is the function $y = -\frac{t^3}{3} + 3t^2 - 5t$ increasing?

- a) $x \in (-\infty, 1]$ **b) $x \in [1, 5]$** c) $x \in [5, \infty)$
 d) $x \in (-\infty, 1] \cup [5, \infty)$ e) All Reals

$\frac{dy}{dt} = -t^2 + 6t - 5$

$-(t^2 - 6t + 5)$

$-(t-5)(t-1)$



4. Suppose $f'(x) = (1-x)(3-x)^2(x-5)^3$. Of the following, which best describes the graph of $f(x)$? NOT AN EXT

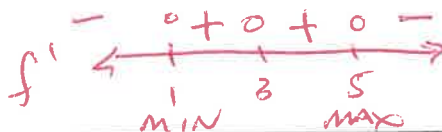
a) $f(x)$ has relative minimum at $x = 1$, a relative maximum at $x = 3$, and neither at $x = 5$

b) $f(x)$ has relative minimum at $x = 3$, a relative maximum at $x = 1$, and neither at $x = 5$

c) $f(x)$ has relative minimum at $x = 5$, a relative maximum at $x = 3$, and neither at $x = 1$

d) $f(x)$ has relative minimum at $x = 1$, a relative maximum at $x = 5$, and neither at $x = 3$

e) $f(x)$ has relative minimum at $x = 5$, a relative maximum at $x = 1$, and neither at $x = 3$



5. Consider a particle moving such that its position is described by the function $x(t) = 6t^2 - t^4$. When does the particle attain its maximum velocity?

a) $t = 0$

b) $t = 1$

c) $t = 2$

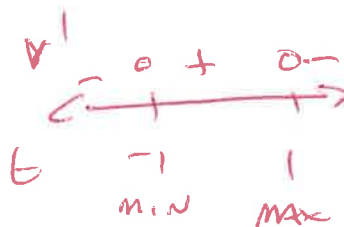
~~d) $t = -1$~~

e) $t = \pm 1$

$$v = 12t - 4t^3$$

$$v' = 12 - 12t^2$$

$$t = \pm 1$$



6. Find the x -value of the absolute maximum of $y = x^2 + x + 2$ on $x \in [-2, 3]$.

a) $x = -\frac{1}{2}$

b) $x = \frac{1}{2}$

c) $x = -2$

d) $x = 2$

e) $x = 3$

$y' = 2x + 1 = 0$
 $x = -\frac{1}{2}$

| x | y |
|----------------|-----|
| -2 | 4 |
| $-\frac{1}{2}$ | MIN |
| 3 | 14 |

7. Given this sign pattern $f'(x)$ $\leftarrow \begin{array}{cccc} - & 0 & + & 0 & + \\ & -3 & & 1 & \end{array} \rightarrow$, on which interval(s) is $f(x)$ increasing?

a) $-3 < x < 1$

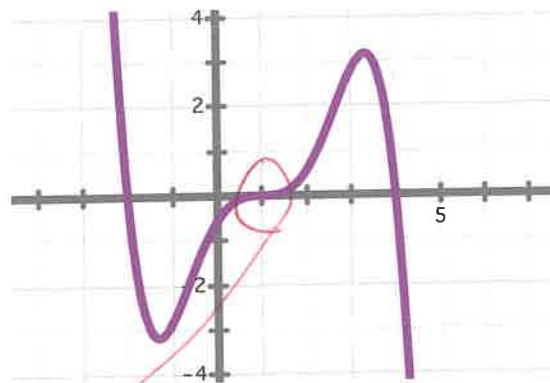
b) $-3 < x < 1$ and $x > 1$

c) $x < -3$

d) $x > 1$

e) It cannot be determined from this sign pattern

8. Which of the following equations matches this graph:



5th DEG
w/ NEG COEF

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

PreCalculus Acc '22-23

Name: SOLUTION KEY

Dr. Quattrin

Polynomials Test-- CALCULATOR ALLOWED

Round to 3 decimal places.

Score (80)

Show all work.

1. Find the zeros of $y = -2x^3 + 9x^2 + 12x - 54$. Show the algebraic support.

$$y = -x^2(2x-9) + 6(2x-9)$$
$$y = (-x^2 + 6)(2x-9)$$
$$(\pm\sqrt{6}, 0) (9/2, 0)$$

2. Find the extreme points of $y = -2x^3 + 9x^2 + 12x - 54$. Show the algebraic work to support critical values.

$$\frac{dy}{dx} = -6x^2 + 18x + 12$$
$$-6x^2 + 18x + 12 = 0$$
$$x^2 - 3x - 2 = 0$$
$$x = \frac{3 \pm \sqrt{17}}{2} = \begin{cases} 3.562 \\ -0.562 \end{cases}$$

(3.562, 12.546)

(-0.562, -57.546)

ii) NONE

iii) NONE

3. Find the zeros and extreme points of $y = x^4 - 3x^2 - 4$ on $x \in [-1, 4]$. Show the algebraic support.

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

$$x = \pm 2$$

$$x = \cancel{(\pm 2, 0)} \quad B$$

$$(2, 0)$$

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

$$\frac{dy}{dx} = 4x^3 - 6x = 2x(2x^2 - 3)$$

$$i) \frac{dy}{dx} = 0 \rightarrow 0, \pm \sqrt{\frac{3}{2}} = \pm 1.225$$

$$ii) \frac{dy}{dx} \text{ DNE: NONE}$$

$$iii) \text{ END POINTS } x = -1, 4$$

$$(0, -4) \quad (1.225, \overset{-6.25}{\cancel{-3.25}})$$

$$(-1, -6) \quad (4, 204)$$

5. The sign pattern for the derivative of $H(x)$ is given. (a) Is $x = -3$ at a maximum, a minimum, or neither? Why? (b) Is $x = 3/4$ at a maximum, a minimum, or neither? Why?

| | | | | | | | |
|---------|---|----|---|-------|---|---|---|
| $H'(x)$ | + | 0 | - | 0 | - | 0 | + |
| x | | -3 | | $3/4$ | | 7 | |

←—————→

b) NEITHER

THE SIGN OF $H'(x)$ DOES NOT CHANGE AT $x = 3/4$

a) $x = -3$ IS AT A MAX BECAUSE H' SWITCHES FROM POSITIVE TO NEGATIVE

6. Find the traits and sketch $y = x^4 - 3x^2 - 4$ on $x \in [-1, 4]$.

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

Range: $y \in [-6.25, 204]$

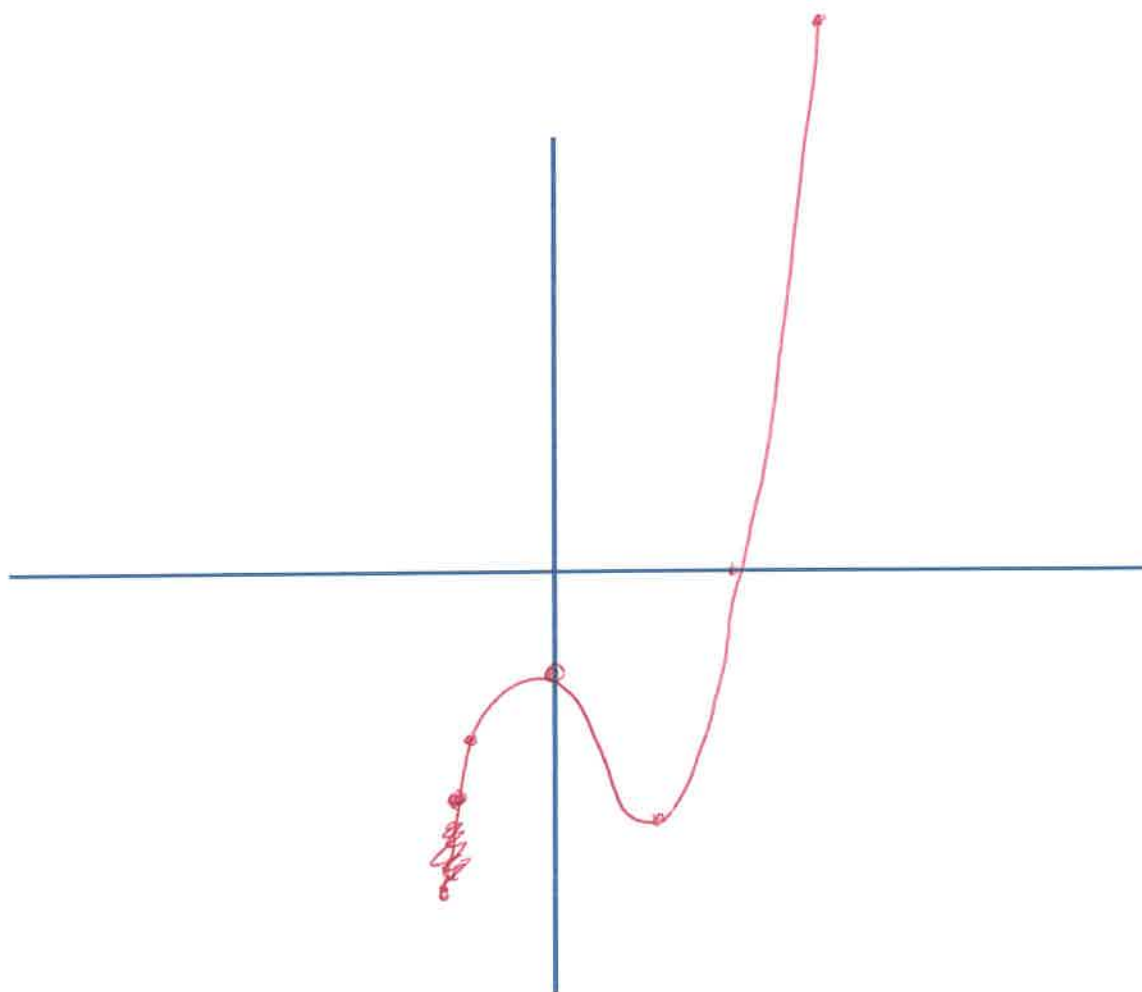
Zeros: $(2, 0)$

Y-Int: $(0, -4)$

End Behavior (left): NONE

Extreme Points: SEE #4

End Behavior (right): NONE



7. Find the traits and sketch of $y = -2x^3 + 9x^2 + 12x - 54$.

Domain: ALL REALS

Range: ALL REALS

Zeros: SEE #1

Y-Int: $(0, -54)$

End Behavior (left): UP

Extreme Points: SEE #2

End Behavior (right): DOWN

