

Precalculus Honors  
Ms Abrao  
Sample Spring Midterm  
Calculator – 35 minutes

Name \_\_\_\_\_  
Date : \_\_\_\_\_  
Period : \_\_\_\_\_

Show all work. Round to 3 decimal places.

**Multiple Choice (3 pts. each)**

1. Find the parabola  $y = ax^2 + bx$  whose tangent line at  $(1,1)$  is  $y = 3x - 2$ .

- (a)  $y = 2x^2 - x$
- (b)  $y = x^2 + 2x$
- (c)  $y = x^2 - 2x$
- (d)  $y = x^2$
- (e)  $y = -2x^2 + 3x$

2. A particle moves along the  $y$ -axis so that its position at time  $0 \leq t \leq 20$  is given

by  $y(t) = 5t - \frac{t^2}{3}$ . At what time does the particle change direction?

- (a) 3.3 seconds
- (b) 5 seconds
- (c) 5.6 seconds
- (d) 7.5 seconds
- (e) 10 seconds

3. If  $f(x) = e^x$ , which of the following is equal to  $f'(e)$ ?

- (a)  $\lim_{h \rightarrow 0} \frac{e^{x+h} - 1}{h}$
- (b)  $\lim_{h \rightarrow 0} \frac{e^{e+h} - e^e}{h}$
- (c)  $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^e}{h}$
- (d)  $\lim_{h \rightarrow 0} \frac{e^{x+h}}{h}$
- (e)  $\lim_{h \rightarrow 0} \frac{e^{e+h} - e}{h}$

4. Consider the functions  $f(x) = 5 + 10x - x^2$ ,  $g(x) = x^3 - 3x^2 + 3x$ , and  $h(x) = x^4 + 4x^3 + 6x^2 + 4x$ . Which of the following statements is completely true?
- (a)  $f(x)$  and  $g(x)$  have absolute maximum points,  $h(x)$  and  $g(x)$  have an absolute minimum points.
- (b)  $f(x)$  and  $h(x)$  have absolute maximum points,  $g(x)$  has an local minimum point, and  $h(x)$  has a local minimum point.
- (c)  $g(x)$  has an absolute maximum point,  $f(x)$  has an local minimum point, and  $h(x)$  has an absolute minimum point.
- (d)  $f(x)$  has an absolute maximum point,  $g(x)$  has both a local minimum point and a local maximum point,  $h(x)$  has an absolute minimum point.
- (e) None of the above is completely true.

5. If  $\frac{d}{dx}[f(x)] = g(x)$  and  $g(x) = f(3x)$ , then  $\frac{d}{dx}[f(x^2)]$  is

- (a)  $2xg(3x^2)$
- (b)  $f(3x^2)$
- (c)  $2xf(3x^2)$
- (d)  $2xf(3x^2) + 2g(x^2)$
- (e)  $4x^2f(3x^2) + 2g(x^2)$

6. If  $f$  is continuous at  $x = 2$ , and if  $f(x) = \begin{cases} \frac{\sqrt{x+2} - \sqrt{2x}}{x-2} & \text{for } x \neq 2 \\ k & \text{for } x = 2 \end{cases}$ , then  $k =$

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

**Free Response (10 pts. each)**

1. List all traits and **sketch**  $y = \ln(x^3 + 6x^2 + 3x - 10)$ .

Domain:

Zeros:

Y-int:

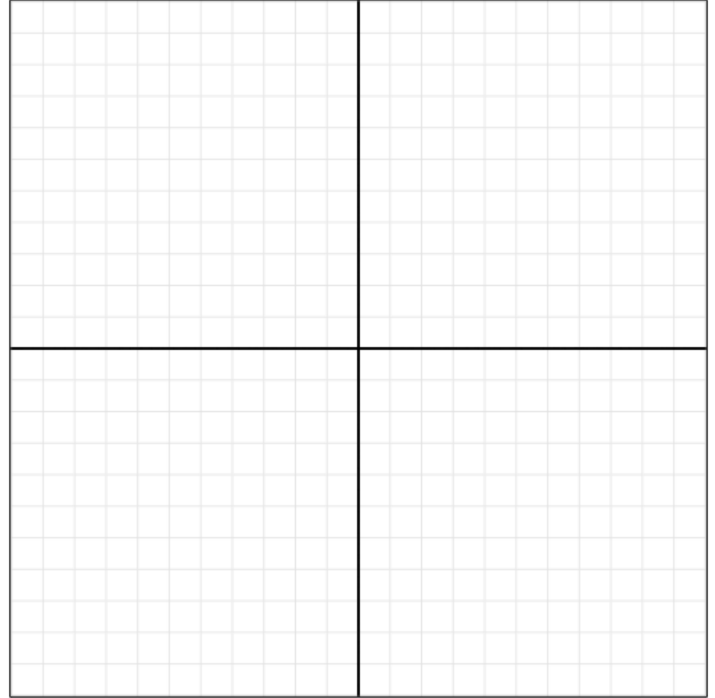
VAs:

POEs:

EB:

Extreme Points:

Range:



Precalculus Honors  
Ms Abrao  
Sample Spring Midterm  
Non-calculator – 25 minutes  
Show all work. Round to 3 decimal places.

Name \_\_\_\_\_  
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**Multiple Choice (3 pts. each)**

7.  $\lim_{x \rightarrow 0} \frac{2x}{\sqrt{x+1}-1}$

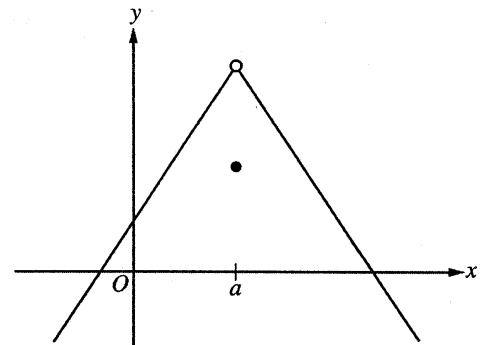
- (a) 0
- (b) 2
- (c) 4
- (d) -2
- (e) DNE

8. If  $f(x) = \sqrt{x^2 - 4}$  and  $g(x) = 3x - 2$ , then the derivative of  $f(g(x))$  at  $x = 3$  is

- (a)  $\frac{15}{\sqrt{21}}$
- (b)  $\frac{30}{\sqrt{21}}$
- (c)  $\frac{7}{\sqrt{5}}$
- (d)  $\frac{14}{\sqrt{5}}$
- (e)  $\frac{18}{\sqrt{5}}$

9. The graph of the function  $f$  is shown below. Which of the following statements must be false?

- (a)  $f(a)$  exists.
- (b)  $f(x)$  is defined for  $0 < x < a$ .
- (c)  $f$  is not continuous at  $x = a$ .
- (d)  $\lim_{x \rightarrow a} f(x)$  exists.
- (e)  $\lim_{x \rightarrow a} f'(x)$  exists.



Graph of  $f$

**Free Response (10 pts. each)**

2. List all traits and **sketch**  $f(x) = \begin{cases} 2x + 3 & x < -3 \\ 0 & x = -3 \\ x^2 + 4x & x > -3 \end{cases}$ .

Domain:

Zeros:

Y-int:

VAs:

POEs:

EB:

Extreme Points:

Range:

