Honors PreCalculus '20-21 Name: Solution Key

Chapter 10 Test

CALCULATOR ALLOWED Score _____

Round to 3 decimal places. Show all work.

1. Find the equation of the line tangent to the function $f(x)=e^{-x}$ when $x=\ln 2$.

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

b) $y-\ln 2=-2(x-2)$

c) $y+2=-2(x-\ln 2)$

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

e) $y-\ln 2=-2(x+2)$

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2. Given $\frac{d}{dx}\left[3x^3-4xy-4y^2=1\right]$ determine the change in y with respect to x:

$9x^2-4x\frac{dy}{dx}-4y(1)-8y\frac{dy}{dx}=0$

a) $\frac{6x-4y}{4x+4}$ b) $\frac{9x^2-4}{4x+8y}$ c) $\frac{9x^2-4}{4+8y}$

d) $\frac{9x^2-4y}{4x+8y}$ e) $\frac{9x^2-4y}{4+8y}$

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3. $f(x)=\frac{e^x}{x}$ on $x\in(0,\infty)$ THE MINIMUM VALUE OF f IS

a) 1 b) e c) $\frac{1}{e}$ d) $e-1$ e) UNDEFINED

$f'(x)=\frac{xe^x-e^x(1)}{x^2}=\frac{e^x(x-1)}{x^2}$

f' DNE $-$ 0 $+$

0 1

MIN

$f(1)=\frac{e^1}{1}=e$

3. A particle is moving along the x-axis in such a way that its velocity at time $t > 0$ is given by $v(t) = \frac{\ln t}{t}$. At what value of t does v attain its maximum?

(a) 1 (b) $e^{1/2}$ (c) e (d) $e^{3/2}$

(e) There is no maximum value of v.

$v' = \frac{t\left(\frac{1}{t}\right) - \ln(t)\,1}{t^2}$

$= \frac{1 - \ln t}{t^2}$

v': DNE + 0 −

0 e

MIN

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4. If $f(x) = g(x)h(x)$, $g(x) = e^{x^2-1}$, and $h(x) = 5x$, find the value of $f'(-1)$ to the nearest integer.

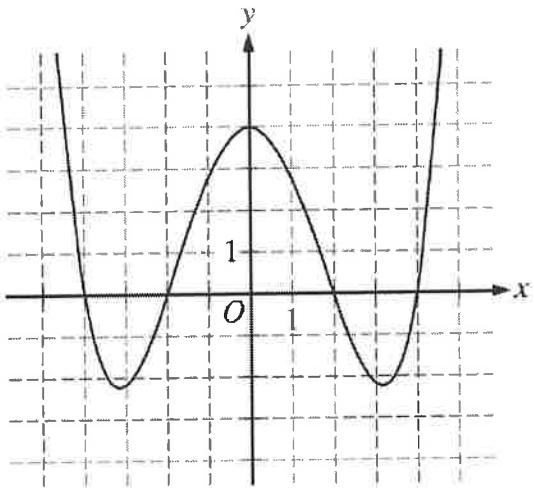
$g' = 2xe^{x^2-1}$ $h' = 5$

a) −10 b) −5 c) 0 d) 5 e) 15

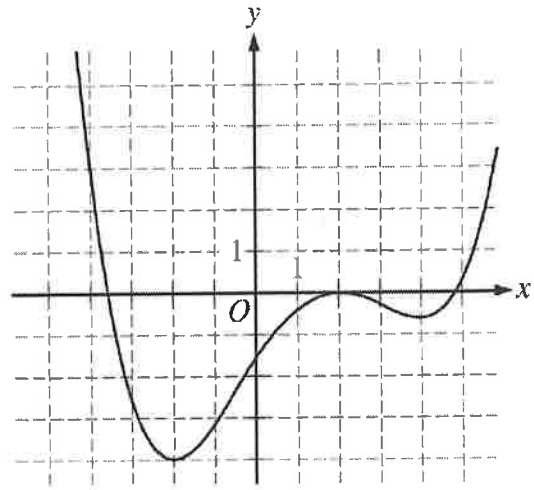
$f' = g(-1)\,h'(-1) + h(-1)\,g'(-1)$

$= e^0\,(5) + 5(-1)(-2e^0)$

$5 + 10$



Graph of f



Graph of g

5. The graphs of the differentiable functions $f(x)$ and $g(x)$ are shown above. If $P(x) = f(x)g(x)$, which of the following will be true about P'?

a) $P'(2) < 0$ b) $P'(2) = 0$ c) $P'(2) > 0$

d) $P'(0) < 0$ e) $P'(0) = 0$

$P' = f(x) \cdot g'(x) + g(x) f'(x)$

$f(2) = 0$
$f'(2) < 0$
$g(2) = 0$
$g'(2) = 0$

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6. What is $\lim_{x \to 0} \frac{3e^{3x} - 3}{\ln(1-x)^2}$?

$\lim_{x \to 0} \frac{3e^{3x}(3)}{-1/1-x} = \frac{9}{-2}$

a) $-\frac{9}{2}$ b) $-\frac{3}{2}$ c) $\frac{3}{2}$ d) $\frac{9}{2}$ e) The limit does not exist

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7. Given the functions $f(x)$ and $g(x)$ that are both continuous and differentiable, and that have values given on the table below, find $h'(2)$, given that $h(x)=g(x)\cdot f(x)$. $g(2)\cdot f'(2)+f(2)\cdot g'(2)=8(-2)+4(1)=-12$

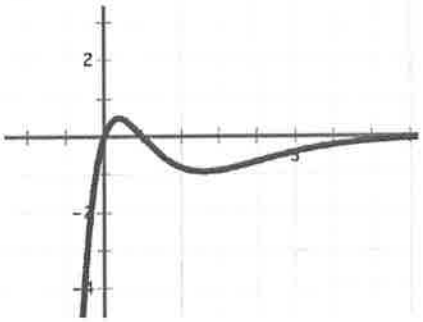
x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
2	4	-2	8	1
4	10	8	4	3
8	6	-12	2	4

a) -12 b) 24 c) 0 d) -48 e) 62

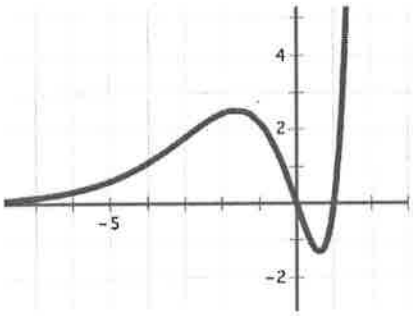
8. Which if the following is the graph of $y=\left(x-x^2\right)\cdot e^x$? LEFT EB → y=0

RIGHT EB 2 DOWN

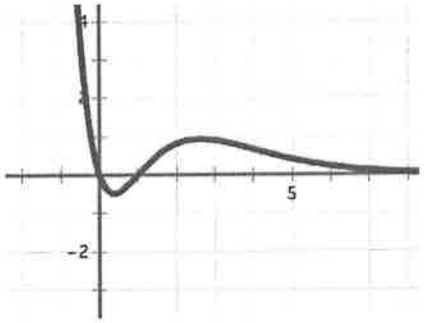
a)



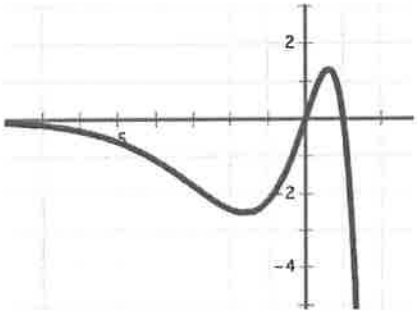
b)



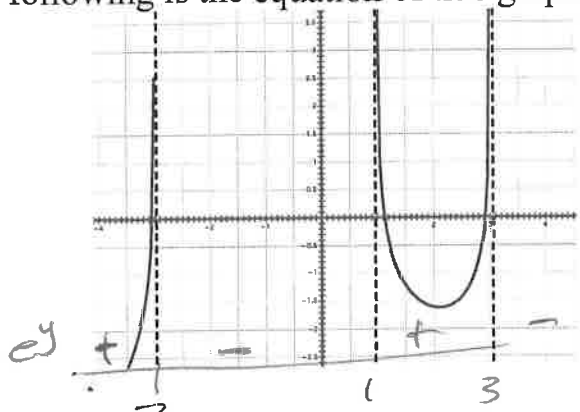
c)



d)



9. Which of the following is the equation of this graph?



a) $y=-\ln\left(\left(x^2-9\right)\left(1-x\right)\right)$

~~b)~~ $y=\ln\left(\left(x^2-9\right)\left(x+1\right)\right)$ WRONG VA

~~c)~~ $y=\ln\left(\left(9-x^2\right)\left(x+1\right)\right)$

WRONG VA

d) $y=\ln\left(\left(9-x^2\right)\left(x-1\right)\right)$

THIS CURVE GOES DOWN ON VAS

Honors PreCalculus '20-21 Name: Solution Key

Chapter 10 Test

CALCULATOR ALLOWED Score _____

Round to 3 decimal places. Show all work.

1. Find domain and zeros of $y=(-x^2)\sqrt{9-x^2}$.

Zeros $(\pm 3, 0), (0, 0)$

Domain $x \in [-3, 3]$

2. Find the extreme points of $y=(-x^2)\sqrt{9-x^2}$. Show the algebraic work to support the critical values.

$$\frac{dy}{dx} = -x^2\left(\frac{1}{2}(9-x^2)^{-1/2}(-2x)\right) + (9-x^2)^{1/2}(-2x)$$

$$= \frac{x^3}{(9-x^2)^{1/2}} - 2x(9-x^2)^{1/2} = \frac{x^3 - 2x(9-x^2)}{(9-x^2)^{1/2}}$$

$$= \frac{3x^3 - 18x}{(9-x^2)^{1/2}}$$

i) $3x^3 - 18x = 0 \rightarrow$

$x = 0, \pm\sqrt{6}$

ii) $\frac{dy}{dx} = \text{DNE} \rightarrow 9 - x^2 = 0 \rightarrow x = \pm 3$

iii) NO END POINTS GIVEN

$(0, 0)$ $(\pm 3, 0)$ $(\pm\sqrt{6}, -6\sqrt{3})$

3. Find domain and zeros of $y=(4x-x^2)e^{x/2}$.

DOMAIN ALL REALS

ZEROS $(0,0)(4,0)$

4. Find the extreme points of $y=(4x-x^2)e^{x/2}$. Show the algebraic work to support the critical values.

$$\frac{dy}{dx}=(4x-x^2)e^{x/2}(1/2)+e^{x/2}(4-2x)$$

$$=e^{x/2}\left(\cancel{2x}-\tfrac{1}{2}x^2-\cancel{2x}+4\right)$$

$$=e^{x/2}\left(-\tfrac{1}{2}x^2+4\right)$$

i) $-\frac{1}{2}x^2+4=0 \rightarrow x^2=8 \quad x=\pm 2\sqrt{2}$

ii) NONE

iii) NONE

$(2\sqrt{2},\ 13.830)$

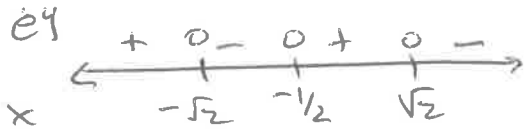
$(-2\sqrt{2},\ -4.695)$

5. Find domain, VAs, and zeros of $y=\ln\left(-2x^3-x^2+4x+2\right)$.

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

$x\in(-\infty,-\sqrt{2})\cup(-1/2,\sqrt{2})$

VAs @ $x=\pm\sqrt{2},\ -1/2$



zeros: $(-1.571,0)$
$(-.242,0)$
$(1.313,0)$

6. Find the extreme points of $y=\ln\left(-2x^3-x^2+4x+2\right)$ on $x\in[-4,2)$. Show the algebraic work to support the critical values.

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

i) $\cancel{x=}\ \dfrac{2\pm\sqrt{100}}{-12}=\begin{cases}\cancel{-1}\\ 2/3\end{cases}$ $\quad(2/3,\ 1.289)$

ii) $\dfrac{dy}{dx}=\text{DNE}\rightarrow x=-1/2,\ \pm\sqrt{2}$

iii) $x=-4,\ \cancel{2}$ $\quad(-4,\ 4.585)$

Honors PreCalculus '17-18
Chapter 10 ~~Re~~Test
NO CALCULATOR ALLOWED

Name: Solution Key

Score _____

7. $y=(5x^2-3)^7(7x^4+4)^{10}$. Find $\frac{dy}{dx}$ in factored form.

$$\frac{dy}{dx}=(5x^2-3)^7\,10(7x^4+4)^9(28x^3)+(7x^4+4)^{10}\,7(5x^2-3)^6(10x)$$

$$=70x(5x^2-3)^6(7x^4+4)^9\left[4x^2(5x^2-3)+(7x^4+4)\right]$$

$$=70x(5x^2-3)^6(7x^4+4)^9(27x^4-12x^2+4)$$

DO TWO OF THE FOLLOWING THREE SKETCHING PROBLEMS

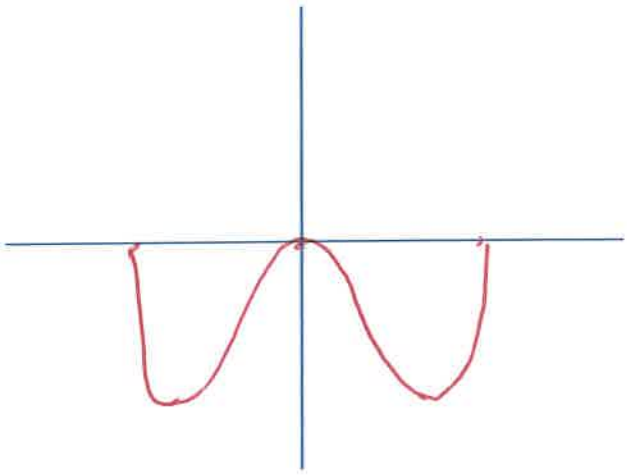
8. Find the traits and **sketch** $y=(-x^2)\sqrt{9-x^2}$.

Y-intercept: $(0,0)$

Range: $y\in[-6\sqrt{3},0]$

End Behavior (Left): NONE

End Behavior (Right): NONE



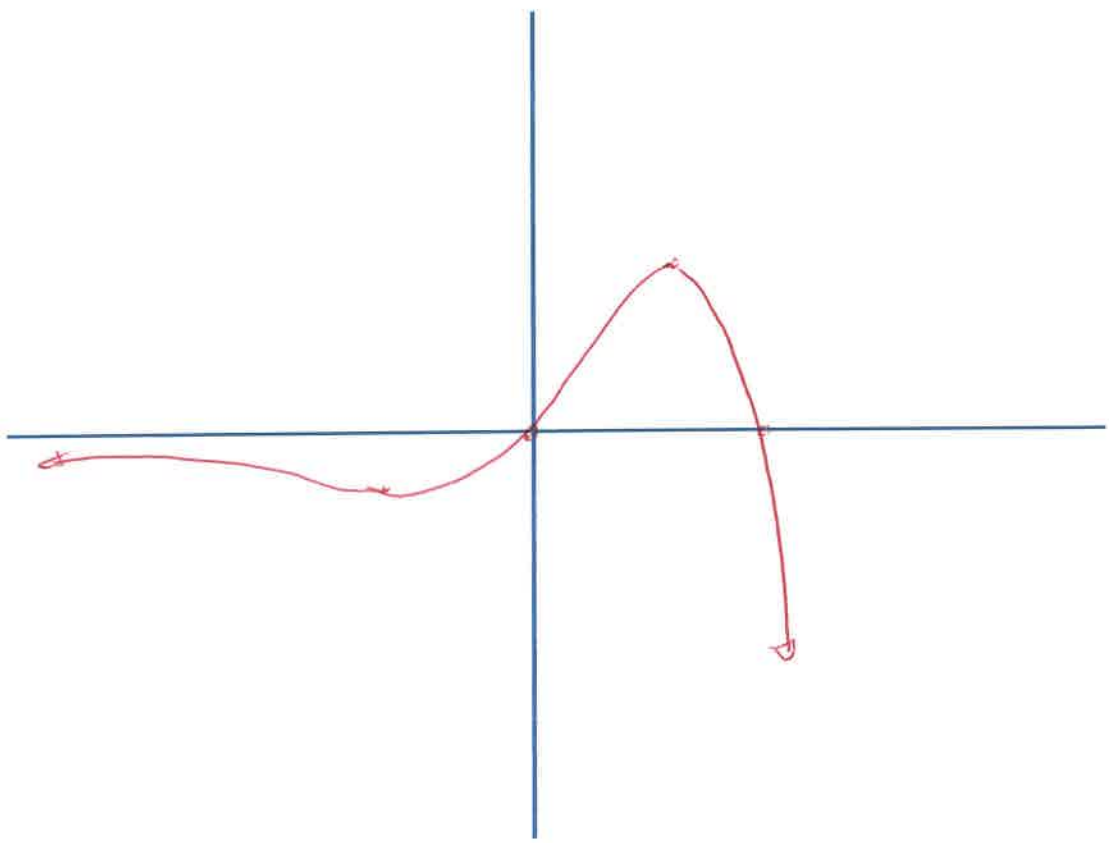
9. Find the traits and **sketch** of $y=(4x-x^2)e^{x/2}$.

Y-intercept: $(0,0)$

Range: $y \in [-\infty, 13.830]$

End Behavior (Left): $y=0$

End Behavior (Right): DOWN



10. Find the traits and **sketch** of $y=\ln\left(-2x^3-x^2+4x+2\right)$ on $x\in[-4,2)$.

Y-intercept: $(0, \ln 2)$

Range: $y \in (-\infty, 4.585]$

End Behavior (Left): NONE

End Behavior (Right): NONE