Honors PreCalculus '17-18
Chapter 10 Test
CALCULATOR ALLOWED
Round to 3 decimal places. Show all work.

Name: Solution Key

Score ________

1. The equation of the line **normal** to $y = 3x\sqrt{x^2+6} - 3$ at $(0, -3)$ is

(a) $x - 3\sqrt{6}y = 9\sqrt{6}$
(b) $x + 3\sqrt{6}y = -9\sqrt{6}$
(c) $3\sqrt{6}x + y = -3$
(d) $3\sqrt{6}x - y = -3$
(e) $x + 3\sqrt{6}y = -3$

$\frac{dy}{dx} = 3x\left(\frac{1}{2}(x^2+6)^{-1/2}(2x)\right) + (x^2+6)^{1/2}(3)$

$m_{TAN} = 0 + (\sqrt{6})3$

$m_{NORM} = \frac{-1}{3\sqrt{6}}$

$y + 3 = \frac{-1}{3\sqrt{6}}(x - 0)$

2. If $5x^3 - 4xy - 2y^2 = 1$, then $\frac{dy}{dx} =$

(a) $\frac{15x^2-4}{4y+4}$ (b) $\frac{15x^2-4y}{4y+4}$ (c) $\frac{15x^2-4}{4y+4x}$

(d) $\frac{15x^2-4}{4x+2}$ (e) $\frac{15x^2-4y}{4x+4y}$

3. Let $f(x) = \frac{e^x}{x}$ on $x \in (0, \infty)$. The maximum value attained by f is

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

4. If $e^{g(x)} = 2x+1$, then $g'(x) =$

$g(x) = \ln(2x+1)$

$g'(x) = \frac{1}{2x+1}(2)$

a) $\dfrac{1}{2x+1}$

b) $\dfrac{2}{2x+1}$

c) $2(2x+1)$

d) e^{2x+1}

e) $\ln(2x+1)$

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5. For any time $t \geq 0$, if the position of a particle in the xy-plane is given by $x = e^t$ and $y = e^{-t}$, then the speed of the particle at time $t = 1$ is

$x' = e^t \quad y' = -e^{-t}$

$S = \sqrt{e^2 + (-e^{-1})^2} =$

a) 2.693

b) 2.743

c) 3.086

d 3.844

e) 7.542

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

$\overset{L'H}{=} \lim_{x \to 0} \dfrac{-3e^{3x}}{\left(-\frac{1}{1-x}\right)} = \dfrac{-3}{-1} =$

a) -1 b) -3 c) 1 d) 3 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 $h(x)=g(x)\cdot f(x)$.

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) -1 c) 0 d) 64 e) 30

$h'(2) = g(2)\cdot f'(2) + f(2)\cdot g'(2)$

$= 8(-2) + 4(1) = -12$

Honors PreCalculus '17-18 Name: Solution K9

Chapter 10 Test

CALCULATOR ALLOWED Score ___________

Round to 3 decimal places. Show all work.

1. Find domain and zeros of $y=(-2x^3)\sqrt{3-x^2}$.

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

Domain $[-\sqrt{3},\sqrt{3}]$

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

x $-\sqrt{3}$ $\sqrt{3}$

2. Find the extreme points of $y=(-2x^3)\sqrt{3-x^2}$. Show the algebraic work to support the critical values.

$$\frac{dy}{dx}=(-2x^3)\frac{1}{\cancel{2}}(3-x^2)^{-1/2}(-\cancel{2}x)+(3-x^2)^{1/2}(-6x^2)$$

$$=\frac{+2x^4}{(3-x^2)^{1/2}}-\frac{6x^2(3-x^2)^{1/2}}{1}=\frac{+2x^4-6x^2(3-x^2)}{(3-x^2)^{1/2}}$$

$$=\frac{8x^4-18x^2}{(3-x^2)^{1/2}}$$

i) $\frac{dy}{dx}=0 \rightarrow 2x^2(4x^2-9)=0$

$x=0,\ \pm 3/2$ BUT $x=0$ is not an extreme

ii) $\frac{dy}{dx}$ DNE $\rightarrow x=\pm\sqrt{3}$

$(\pm\sqrt{3},0)$ $\left(\frac{3}{2}, -5.846\right)$

$\left(\frac{-3}{2}, 5.846\right)$

3. Find domain and zeros of $y=(x^2-7)e^{-x/2}$.

$x = (\pm\sqrt{7}, 0)$

Domain All Reals

4. Find the extreme points of $y=(x^2-7)e^{-x/2}$. Show the algebraic work to support the critical values.

$$\frac{dy}{dx} = (x^2-7)e^{-x/2}(-1/2) + 2x e^{-x/2}$$

$$= e^{-x/2}\left[-\frac{1}{2}x^2 + 2x + 7/2\right]$$

i) $\frac{dy}{dx} = 0 \rightarrow x = \dfrac{-2 \pm \sqrt{4^2 - 4(-7/2)(-1/2)}}{2(-1/2)} = \begin{cases} -1.317 \\ 5.317 \end{cases}$

~~(-1, 9, 892)~~

$(5, \cancel{1.478})$

$(-1.317, -10.172)$

$(5.317, 1.490)$

ii) $\frac{dy}{dx}$ DNE → None

iii) End Points: None

5. Find domain, VAs, and zeros of $y = \ln(x^3 - 7x + 6)$.

VAS: $x = -3, 1, 2$

ZEROS $(-2.949, 0)$ $(.783, 0)$ $(2.166, 0)$

DOMAIN e^y $\quad - \; 0 \; + \; 0 \; - \; 0 \; +$ $\quad x \in (-3, 1) \cup (2, \infty)$

$-3 \qquad 1 \qquad 2$

6. Find the extreme points of $y = \ln(x^3 - 7x + 6)$ on $x \in (-3, 3)$. Show the algebraic work to support the critical values.

$$\frac{dy}{dx} = \frac{3x^2 - 7}{x^3 - 7x + 6}$$

i) $\frac{dy}{dx} = 0 \rightarrow x = \pm\sqrt{7/3} = \pm 1.538$ $\quad (-1.538, 2.575)$

ii) $\frac{dy}{dx}$ DNE $\rightarrow x = -3, 1, 2$ BUT NONE OF THESE ARE IN THE DOMAIN

iii) END POINTS: ~~NONE GIVEN~~ $(3, 2.485)$

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7. $y=(4x-3)^9(3x^7+1)^3$. Find $\frac{dy}{dx}$ in factored form.

$(4x-3)^9\left[3(3x^7+1)^2\, 21x^6\right] + (3x^7+1)^3\left[9(4x-3)^8(4)\right]$

$9(4x-3)^8(3x^7+1)^2\left[7x^6(4x-3)+4(3x^7+1)\right]$

$9(4x-3)^8(3x^7+1)^2(40x^7-21x^6+4)$

DO TWO OF THE FOLLOWING THREE SKETCHING PROBLEMS

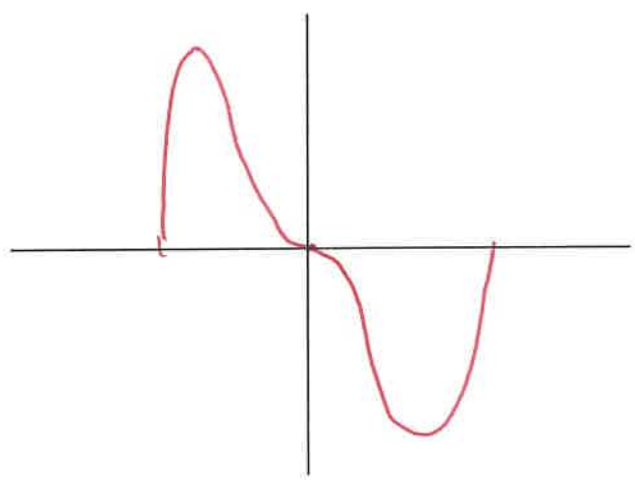
8. Find the traits and **sketch** $y=(-2x^3)\sqrt{3-x^2}$.

Y-intercept: $(0,0)$

Range: $\boxed{[-5.846, 5.846]}$

End Behavior (Left): NONE

End Behavior (Right): NONE



9. Find the traits and **sketch** of $y=(x^2-7)e^{-x/2}$.

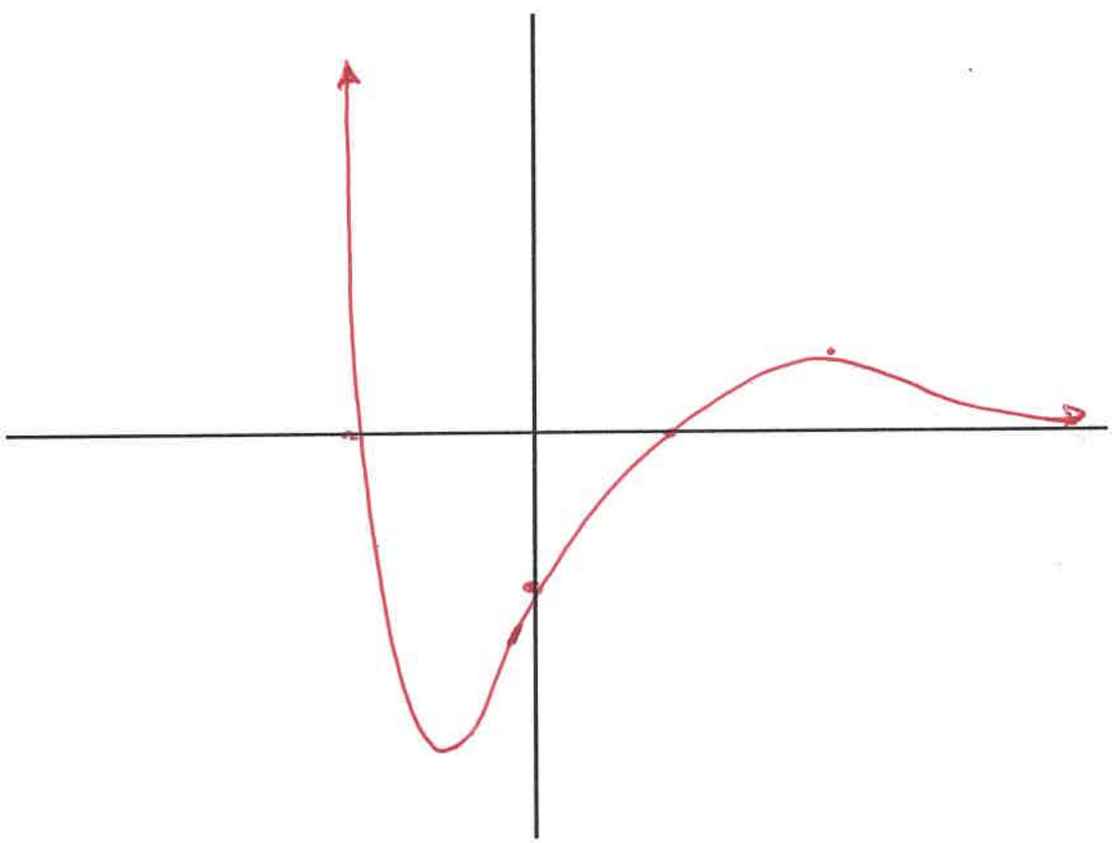
$[-10.172, \infty)$

Y-intercept: $(0, -7)$

Range: $[\cancel{-4.\,357}2, \infty)$

End Behavior (Left): up

End Behavior (Right): $y=0$



10. Find the traits and **sketch** of $y = \ln\left(x^3 - 7x + 6\right)$ on $x \in (-3, 3)$.

Y-intercept: $(0, \ln 6)$

Range: $(-\infty, \ln 12)$

End Behavior (Left): NONE

End Behavior (Right): NONE