A.M.D.G.

Precalculus Accelerated
Spring Practice Final 2014
Part I: CALCULATOR REQUIRED

Name: _____

Period: _____ Date: _____

All Standards covered from Chapter 5 through Chapter 9 will be covered for this exam.

Multiple Choice

1. $\lim_{x\to 0} \dfrac{\sqrt{49-x^2}-7}{9x} = \dfrac{0}{0}$ L'Hopital's Rule

$\lim_{x\to 0} \dfrac{\frac{1}{2}(49-x^2)^{-1/2}(-2x)}{9} = \lim_{x\to 0} \dfrac{x}{9\sqrt{49-x^2}} = 0$

(a) $-\dfrac{1}{9}$
(b) $-\dfrac{7}{9}$
(c) 1
(d) 0
(e) DNE

2. If \$300 is invested at 3% compounded continuously, how long (to the nearest year) will it take for the money to double? (Use the formula $A = Pe^{rt}$)

(a) 26
(b) 25
(c) 24
(d) 23
(e) 22

$600 = 300e^{0.03t}$

$2 = e^{0.03t}$

$\ln 2 = \ln e^{0.03t}$

$0.03t = \ln 2$

$t = \dfrac{\ln 2}{0.03} \approx 23$

3. If $\sin y = -\dfrac{7}{25}$, find $\cos 2y$.

(a) $-\dfrac{48}{25}$
(b) $-\dfrac{14}{25}$
(c) $\dfrac{134}{625}$
(d) $\dfrac{527}{625}$
(e) Cannot be determined without knowing the quadrant that y lays in

$\cos 2y = \cos^2 y - \sin^2 y = \left(\pm\dfrac{24}{25}\right)^2 - \left(-\dfrac{7}{25}\right)^2 = \dfrac{527}{625}$

4. At what point on the graph of $y = \ln x$ is the tangent line *parallel* to $x - 2y = 1$?

$y' = \frac{1}{x}$ $\quad m = \frac{1}{2}$

$m_T = \frac{1}{x} = \frac{1}{2}$

(a) $\left(\frac{1}{2}, 2\right)$

(b) $\left(\frac{1}{2}, \ln\frac{1}{2}\right)$

(c) $(1, 0)$

(d) $(2, \ln 2)$

(e) $(e^2, 2)$

5. Write the equation of a sine function with the following characteristics:

Amplitude: 5 Period: 3π Phase Shift: $\frac{\pi}{3}$

(a) $y = 5\sin\left(3x + \frac{2\pi}{9}\right)$ (b) $y = 5\sin\left(3x - \frac{2\pi}{9}\right)$ (c) $y = 5\sin\left(\frac{2}{3}x + \frac{2\pi}{9}\right)$

(d) $y = 5\sin\left(\frac{3}{2}x + \frac{2\pi}{9}\right)$ (e) $y = 5\sin\left(\frac{2}{3}x - \frac{2\pi}{9}\right)$

$y = 5\sin\left[\frac{2}{3}\left(x - \frac{\pi}{3}\right)\right]$

Free Response

1. Find the domain, zeros, and extreme points of $f(x) = -\sqrt{x^2 - 2x}$.

Domain: $x^2 - 2x \geq 0 \Rightarrow x(x-2) \geq 0 \Rightarrow$ + 0 − 0 + (0, 2) Domain $x \in (-\infty, 0] \cup [2, \infty)$

Zeros: $(0,0)$ $(2,0)$

Extreme Points: $f(x) = -(x^2 - 2x)^{\frac{1}{2}}$

$f'(x) = -\frac{1}{2}(x^2 - 2x)^{-3/2}(2x - 2) = -\frac{x-1}{(x^2-2x)^{3/2}} = 0$ or undef

$f' = 0$ when $x - 1 = 0 \Rightarrow x = 1$

f' = undef when $x^2 - 2x = 0 \Rightarrow x = 0, 2$

+ undef 0 NOT IN DOMAIN undef − (0, 1, 2)

Extreme Values at $(0,0)$ and $(2,0)$

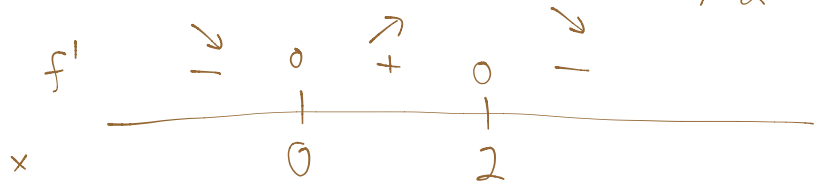
max max

2. Find the domain and extreme points of $f(x)=x^2e^{-x}$.

Domain: All Reals

Extreme Points: $f'(x)=2xe^{-x}-x^2e^{-x}=xe^{-x}(2-x)=0$

$x=0$ $\quad x=2$



Extreme Values at $(0,0)$ and $\left(2,\frac{4}{e^2}\right)$

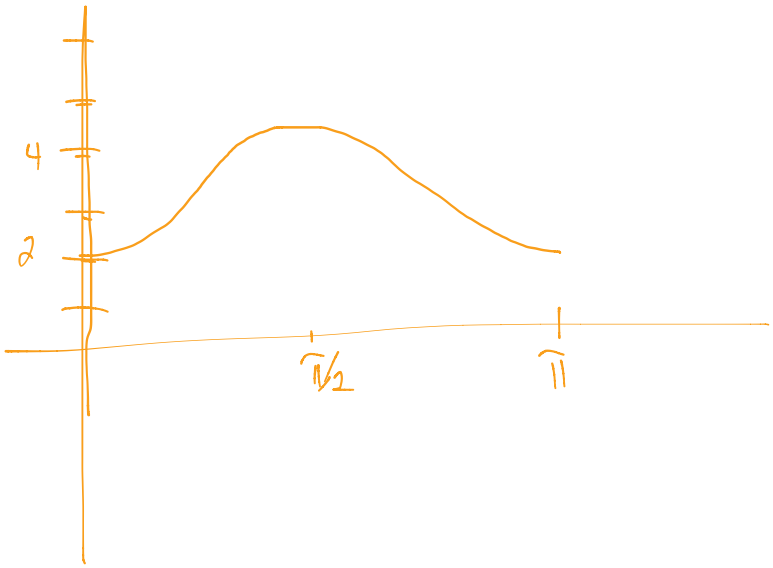
3. Sketch carefully the primary cycle of $y=3-\cos\left[2(x+4\pi)\right]$. Show coordinates of all maxima, minima, and axis points. State the values of *k*, *A*, Period, and *h*. Write linear equations for sinusoidal axes and asymptotes.

$k=3$

$A=1$

Period $=\pi$

$h=4\pi$



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Part II: NO CALCULATOR ALLOWED

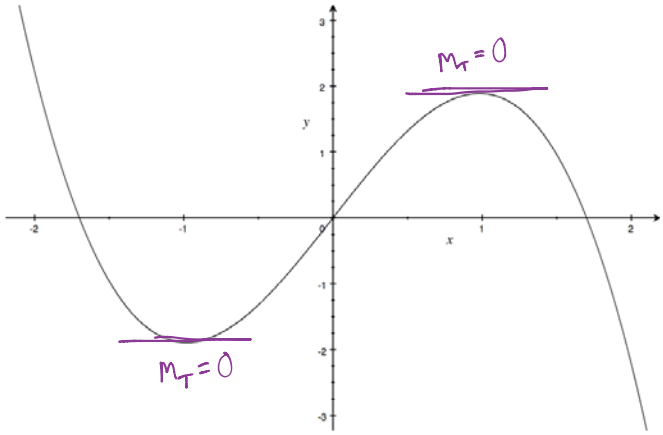
Name: _____

Period: _____ Date: _____

Directions: Complete each of the following NEATLY IN PENCIL in the space provided. Show all work. Round at **THREE** decimal places. Good Luck!

Multiple Choice (3 pts. each)

6. Let the graph at right represent $f(x)$ on the interval $[-2, 2]$. For which values of x is $f'(x) = 0$?



(a) $-2, -1, 0, 1, 2$
(b) 0
(c) $-1, 1$
(d) $-2, -1, 1, 2$
(e) $-1.7, 0, 1.7$

7. Which of the following lines intersects $y = 3\sin x + 2$?

(a) $y = -2$
(b) $y = 7$
(c) $y = 3$
(d) $y = -5$
(e) None of these lines intersect the graph

4. A ship sails 40 miles on a bearing of 30°, then it turns and sails 60 miles on a bearing of 100°. How far away from its starting point and on what bearing is it?

$\vec{v} = (40\cos 30°)i + (40\sin 30°)j$

$\vec{w} = (60\cos 100°)i + (60\sin 100°)j$

How far away $= |\vec{v} + \vec{w}|$

$\vec{v} + \vec{w} = \underbrace{(40\cos 30° + 60\cos 100°)}_{\text{stored in A}}i + \underbrace{(40\sin 30° + 60\sin 100°)}_{\text{stored in B}}j$

(recommend storing these values on the calculator)

$\approx 24.222i + 79.088j$

$|\vec{v} + \vec{w}| = \sqrt{A^2 + B^2} \approx 82.715$ miles

Bearing $= \theta = \pm\cos^{-1}\left(\frac{A}{|v+w|}\right) \approx 72.972°$

Free Response

5. Find all traits and sketch $f(x)=e^{\sqrt{x^2-2x}}$

Domain: $x^2-2x\geq 0 \Rightarrow x(x-2)\geq 0 \Rightarrow$ + 0 − 0 + on 0, 2 Domain $x\in(-\infty,0]\cup[2,\infty)$

Zeros: none

y-intercept: $(0,1)$

VAs: none

EB: none

POEs: none

Extreme Points: $y'=e^{\sqrt{x^2-2x}}\left(\frac{x-1}{(x^2-2x)^{1/2}}\right)=0$ or undef

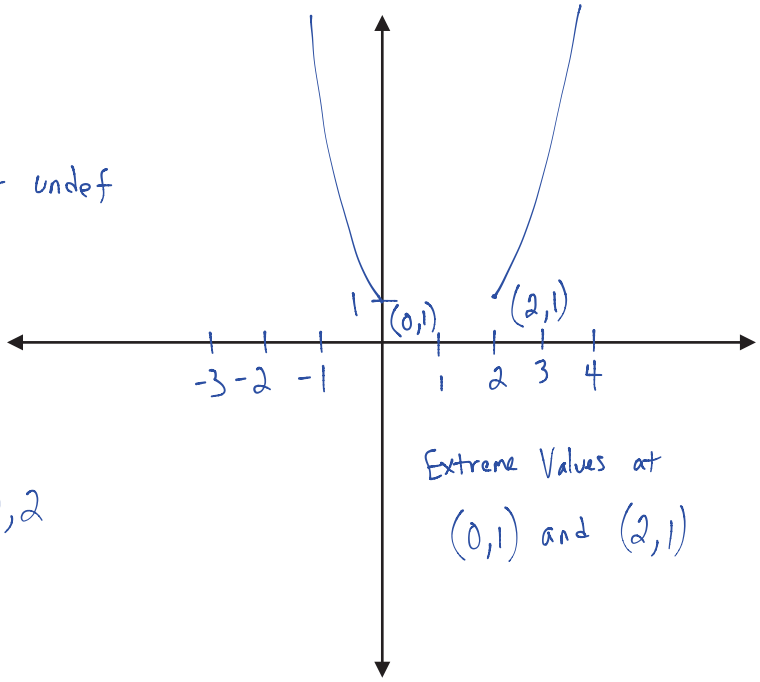
Range: $y\geq 1$

never 0

$f'=0$ when $x-1=0 \Rightarrow x=1$

$f'=$ undef when $x^2-2x=0 \Rightarrow x=0,2$

− undef NOT IN DOMAIN 0 undef + on 0, 1, 2



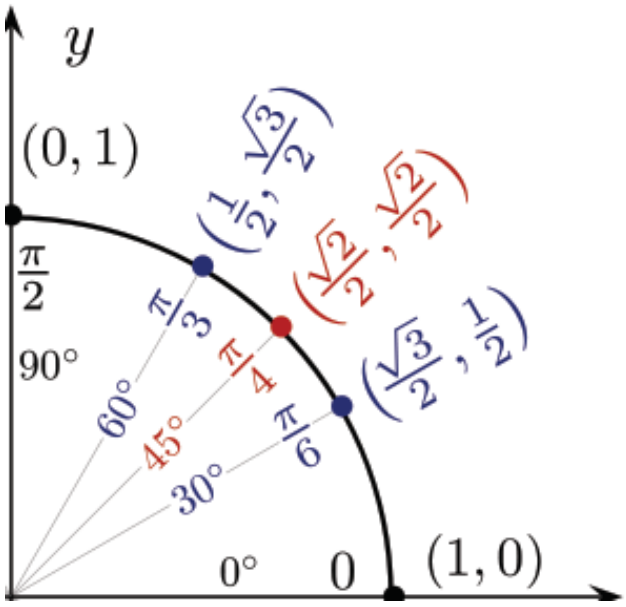
6. Convert the given radian angle measures to degrees

a) $\frac{2\pi}{15}$ rad $\cdot\left(\frac{180^\circ}{\pi \text{ rad}}\right)$ 24°

b) $-\frac{8\pi}{9}$ -160°

c) $\frac{31\pi}{30}$ 186°

7. Using the unit circle only, find all values of $0° < \theta < 360°$ for which $\cos\theta = -\frac{1}{2}$



$\cos\theta < 0$ in QII and QIII

ref angle = 60°

$\theta = 120°$ and $240°$

8. Simplify $\sec\frac{4\pi}{3} + \cot^2\frac{7\pi}{6}$

$\frac{1}{\cos\frac{4\pi}{3}} + \frac{1}{\tan^2\frac{7\pi}{6}} = -2 + (-\sqrt{3})^2 = 1$

9. Given the angle θ in Quadrant III, find ***all*** possible values of θ for which $\sin\theta = -0.9612616959$

$\sin^{-1}(-0.9612616959) = -74°$, $180 - (-74°)$

$254°$ ↑ QIII

$\theta = 254° \pm 360n$

10. Given the angle θ for which $\cos\theta = 0.2756373558$, find the possible values of θ over the interval $0 < \theta < 360°$.

$\cos^{-1}(0.2756373558) = 74°, -74°$

↑ not between 0° and 360° so just add 360°

$\theta = 74°, 286°$