KEY

MATH 150, FALL 2014
EXAM III MULTIPLE CHOICE - VERSION B

LAST NAME(print): ______________________ FIRST NAME(print): ______________________

UIN: ______________________ SECTION NUMBER: ____________

DIRECTIONS:

1. This is a 10-question multiple-choice exam; there is no partial credit. Each problem is worth 5 points for a total of 50 points. Mark the correct choice on your ScanTron using a No. 2 pencil. The scantrons will not be returned, therefore *for your own records, also record your choices on your exam!*
2. The use of a calculator and computer is prohibited.
3. TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
4. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*
5. Your exam grade (sum of both exam parts) will be posted in WebAssign.
6. You may not discuss the contents of the exam with anyone until the exam is returned in class.

THE AGGIE CODE OF HONOR

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

Signature: ______________________________

My signature in this blank allows my instructor to pass back my graded exam in class or allows me to pick up my graded exam in class on the day the exams are returned. If I do not sign the blank or if I am absent from class on the day the exams are returned, I know I must show my Texas A&M student ID during my instructor's office hours to pick up my exam.

Signature: ______________________________

1. If a circle has a 18 meter diameter, find the exact area of the sector subtended by a central angle of 20 degrees.

(a) $\pi\ m^2$
(b) $4.5\pi\ m^2$
(c) $810\ m^2$
(d) $18\pi\ m^2$
(e) $3240\ m^2$

$r = 9m.$

$20^\circ = 20^\circ \times \frac{\pi \text{ rad}}{180^\circ} = \frac{\pi}{9} \text{ rad}$

Sector Area $= \frac{1}{2} r^2 \theta = \frac{1}{2} 9^2 \cdot \frac{\pi}{9} = \frac{9}{2}\pi$

$= 4.5\pi\ m^2$

$= -2\sin(3(x+3)) - 1$

2. What is the amplitude, period, and phase shift, respectively, of $f(x) = -2\sin(3x+9) - 1$

(a) Amplitude=2, period=$\frac{2}{3}\pi$, and phase shift=-3
(b) Amplitude=2, period=$\frac{2}{3}\pi$, and phase shift=-9
(c) Amplitude=2, period=$\frac{2}{3}\pi$, and phase shift=7
(d) Amplitude=-2, period=$\frac{2}{3}\pi$, and phase shift=3
(e) Amplitude=-2, period=2π, and phase shift=-1

amplitude $= |a| = |-2| = 2$

period $= \frac{2\pi}{k} = \frac{2\pi}{3}$

phase shift $= -3$

3. Find the **SUM** of the solutions. If there is only one answer, give it.

$$\log_9(x-5) + \log_9(x+3) = 1$$

(a) 2
(b) 5
(c) 6
(d) -2
(e) -3

$\Rightarrow \log_9 (x-5)(x+3) = 1$

$\Rightarrow (x-5)(x+3) = 9^1$

$\Rightarrow x^2 - 2x - 15 = 9$

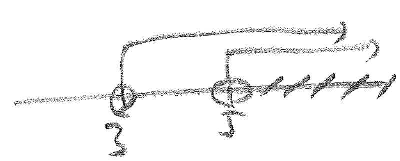
$\Rightarrow x^2 - 2x - 24 = 0$

$\Rightarrow (x+4)(x-6) = 0$

$\therefore \cancel{x = -4},\ \underline{x = 6}$

Domain : $x-5>0$ and $x+3>0$

$\Rightarrow x>5$ and $x>-3$



$\boxed{\therefore\ x>5}$

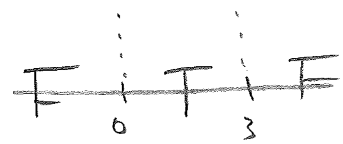
4. What is the domain of the function $f(x) = \dfrac{\ln(2x-1)}{\sqrt{3x-x^2}}$

(a) $(0,3)$
(b) $(\frac{1}{2},3]$
(c) $[\frac{1}{2},3]$
(d) $(\frac{1}{2},3)$
(e) $(-\infty,\frac{1}{2})\cup(3,\infty)$

$2x-1>0$ and $3x-x^2>0$

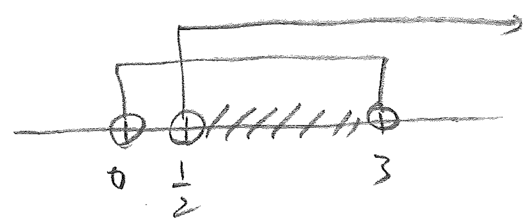
$\Rightarrow 2x>1$ and $x^2-3x<0$

$\Rightarrow x>\frac{1}{2}$ $\quad x(x-3)<0$



$\Rightarrow 0<x<3$

$\Rightarrow$



$\therefore \frac{1}{2}<x<3$ or $(\frac{1}{2},3)$

5. Exactly solve $e^x - 12e^{-x} - 1 = 0$ for x

(a) $x=0$
(b) $x=\ln 3$
(c) $x=2\ln 2$
(d) $x=\ln 3, x=2\ln 2$
(e) None of these

Since $e^x \neq 0$, mutiply e^x on both sides

$\Rightarrow e^{2x}-12-e^x=0$

$\Rightarrow e^{2x}-e^x-12=0$

$\Rightarrow (e^x+3)(e^x-4)=0$

$\therefore \cancel{e^x=-3}, e^x=4$

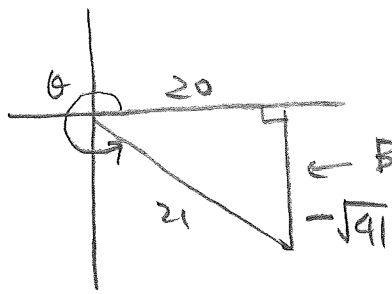
$\therefore x=\ln 4=2\ln 2$

6. simplify: $(\log_7 3)(\log_3 35)$ $= \frac{\cancel{\log_c 3}}{\log_c 7}\cdot\frac{\log_c 35}{\cancel{\log_c 3}} = \frac{\log_c 35}{\log_c 7} = \log_7 35$

   (a) $\log_2 7$
   (b) $\log_7 12$
   (c) $\log_7 35$
   (d) $\log_{10} 12$
   (e) $\log_{10} 35$

7. If $\cos\theta = \frac{20}{21}$ and θ is in Quadrant IV, exactly find $\tan\theta$.

   (a) $-\frac{20}{\sqrt{41}}$
   (b) $-\frac{\sqrt{41}}{20}$
   (c) $-\frac{41}{20}$
   (d) $\frac{20}{\sqrt{41}}$
   (e) $\frac{\sqrt{41}}{20}$

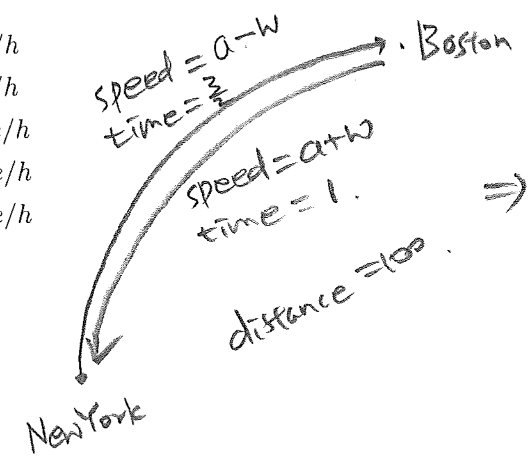


← By Pythagorean, $\sqrt{21^2-20^2} = \sqrt{441-400}$
$= \sqrt{41}$

$\Rightarrow \tan\theta = \frac{-\sqrt{41}}{20}$

8. A plane files a round trip between New York and Boston. The flight from the New York is into a strong headwind and takes 1 hour and 30 minutes. The return flight from Boston is with the wind and take 1 hour. If the cites are 100 miles apart what is the aircraft's speed in miles per hours. Assume that both the aircraft's and wind's speeds are constant.

   (a) $\frac{50}{3}$ *mile/h*
   (b) 70 *mile/h*
   (c) $\frac{250}{3}$ *mile/h*
   (d) 100 *mile/h*
   (e) 110 *mile/h*



(distance) = (speed) × (times)

$$\Rightarrow \begin{cases}(a-w)\cdot\frac{3}{2} = 100\\ (a+w)\cdot 1 = 100\end{cases} \Rightarrow \begin{cases} a-w = \frac{200}{3} \\ a+w = 100 \end{cases} (+$$

$$\Rightarrow 2a = \frac{200}{3} + 100 = \frac{200}{3} + \frac{300}{3}$$

$$\Rightarrow 2a = \frac{500}{3}$$

$$\boxed{\therefore a = \frac{250}{3}}$$

9. Exactly solve the system of equations for all points with real number coordinates. Then find the **SUM** of all the y-values of these points.

$$x^2 + y^2 = 4x$$
$$x = y^2$$

(a) $3 + \sqrt{3}$
(b) $3 - \sqrt{3}$
(c) 0
(d) $\sqrt{3}$
(e) 3

$\Rightarrow x^2 + x = 4x$

$\Rightarrow x^2 - 3x = 0$

$\Rightarrow x(x-3) = 0$

$\therefore x = 0, \quad x = 3$

for $x = 0$, $0 = y^2 \therefore y = 0$

for $x = 3$, $3 = y^2$

$\Rightarrow y = \pm\sqrt{3}$

$\therefore$ Sum of y-values $= 0$.

10. The half-life of Cesium-137 is 30 years. Suppose we have $10g$ sample. How much of the sample will remain after 80 years? (Note. $\ln 0.5 \approx -0.69$, $e^{-1.84} \approx 0.16$)

(a) $0.16g$
(b) $1.6g$
(c) $5.3g$
(d) $6.9g$
(e) None of these

Since the half-life is 30 years,

$r = \frac{\ln 2}{30}$

$\Rightarrow m(t) = 10 \cdot e^{-\frac{\ln 2}{30} \cdot t}$

After 80 years

$\Rightarrow m(80) = 10 \cdot e^{-\frac{\ln 2}{30} \cdot (80)} = 10 \cdot e^{-\frac{8}{3} \cdot \ln 2}$

$= 10 \cdot e^{-\frac{8}{3} \cdot (0.69)}$

$= 10 \cdot e^{-8 \cdot 0.23}$

$= 10 \cdot e^{-1.84} \approx \boxed{1.6g}$