


Pre-Calculus Fall Final Exam 2014

Name: _____

Pd: _____ Date: _____

Part 1: No calculator

Question: 1

 Evaluate: $\sin\left(\frac{136\pi}{3}\right) + \cos\left(\frac{125\pi}{4}\right)$

A. $\frac{1-\sqrt{2}}{2}$

B. $\frac{\sqrt{3}-\sqrt{2}}{2}$

C. $-\frac{\sqrt{3}+\sqrt{2}}{2}$

D. $-\frac{1+\sqrt{2}}{2}$

E. $\frac{\sqrt{2}-1}{2}$

Question: 2

Which of the following is true about symmetry of an equation?

- A) Graph is **symmetric with respect to the x-axis** if for every point (x,y) on the graph, the point $(-x, y)$ is also on the graph.
- B) Graph is **symmetric with respect to the y-axis** if for every point (x,y) on the graph, the point $(-x, -y)$ is also on the graph.
- C) Graph is **symmetric with respect to the origin** if for every point (x,y) on the graph, the point $(-x, -y)$ is also on the graph.
- D) Graph is **symmetric with respect to the y-axis** if for every point (x,y) on the graph, the point $(x, -y)$ is also on the graph.

Question: 7

Evaluate the following trigonometric expression:

$$\sin 80^\circ \sin 50^\circ + \sin 10^\circ \sin 40^\circ$$

A) $-\frac{\sqrt{3}}{2}$

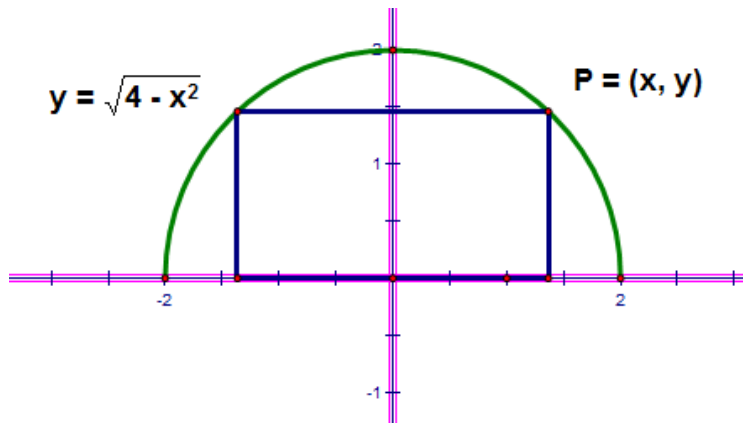
B) $\frac{1}{2}$

C) $\frac{\sqrt{2}}{2}$

D) $\frac{\sqrt{3}}{2}$

Question: 8

A rectangle is inscribed in a semicircle of radius 2 as shown below. Let $P = (x, y)$ be the point on quadrant 1 that is a vertex of the rectangle and is on the circle ($y = \sqrt{4 - x^2}$).



Express the area of the rectangle as a function of x .

A) $x\sqrt{4 - x^2}$

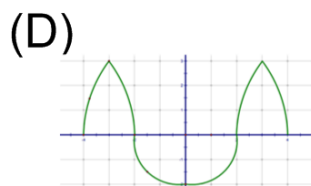
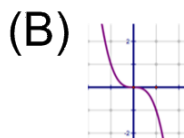
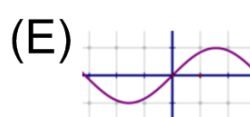
B) $2x\sqrt{4 - x^2}$

C) $\sqrt{8x - 2x^3}$

D) $-x\sqrt{4 - x^2}$

Question: 9

For which of the following graphs of f does $f(x) = f(-x)$ for all values of x shown?



Question: 10

Solve for y without the use of a calculator.

If $4^y = 8^x$ and $3^x = 2(3^y)$

A) $\frac{3 \ln 2}{\ln 3}$

C) $\frac{-3 \ln 2}{\ln 3}$

B) $\frac{-2 \ln 2}{\ln 3}$

D) $\frac{2 \ln 2}{\ln 3}$

Question: 11

The terminal side of an angle θ , in standard position passes through the point $(7, -24)$. What is $\csc \theta$?

a. $-\frac{24}{25}$

b. $-\frac{25}{24}$

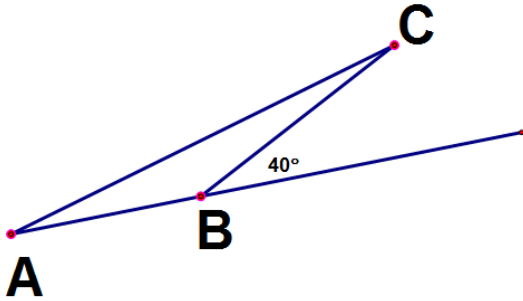
c. $\frac{24}{25}$

d. $-\frac{25}{7}$

e. $-\frac{24}{7}$

Question: 12 Calculator allowed**

An airplane flies from city A to city B, a distance of 150 miles, and then turns through an angle of 40° and heads to city C, as shown in the figure below.



If the distance between city A and city C is 300 miles, how far is it from city B to city C?

- A) 169.18 miles B) 140° C) 200 miles D) 185.23 miles

Question: 13

Find the exact value of the expression below.

$$\sin^2(20^\circ) + \frac{1}{\sec^2(20^\circ)}$$

- A. 0 B. 20 C. -1 D. 1 E. None

Question: 14

From the double-angle formula below, derive a half-angle formula.

$$\cos^2 \alpha = \frac{1 + \cos(2\alpha)}{2}$$

A) $\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \cos \alpha}{2}}$

C) $\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \cos \alpha}{2}}$

B) $\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \sin \alpha}{2}}$

D) $\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$

Question: 15

Which statement is completely true about the cubic function $f(x) = x^3$

- A) f is even, and always increasing.
- B) f is odd and symmetric about the x -axis
- C) f is odd, symmetric about the y -axis, and has no local minimum
- D) f is odd, symmetric about the origin, and has no local maximum

Question: 16

Form the difference quotient for $f(x) = \frac{1}{5x+7}$ and evaluate it at $x = -3$.

- a. $\frac{-1}{8}$
- b. $\frac{-5h}{64-40h-5}$
- c. $\frac{-5}{40h-64}$
- d. $\frac{5}{40h-64}$

Question: 17

If θ is an acute angle and $\sin(\theta) = \frac{3}{5}$, Evaluate $\sin(2\theta) + \cos(2\theta)$

- A) $\frac{41}{25}$
- B) $\frac{31}{25}$
- C) $\frac{17}{25}$
- D) $\frac{17}{5}$

Question: 18

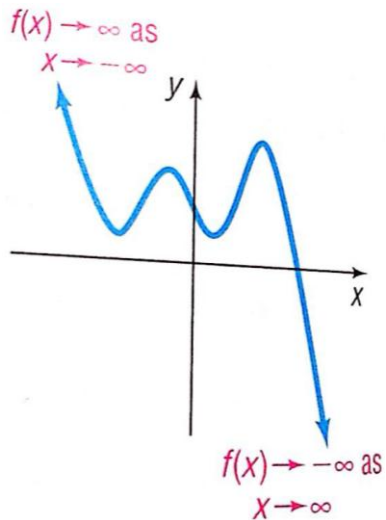
Evaluate the discriminant of the quadratic equation below.

$$y = 2x^2 - 3x + 4$$

- A) -23
- B) -41
- C) 41
- D) Not here

Question: 23

Which of the following can be the properties of the given polynomial?



- A) $n \geq 2$ even, $a_n < 0$ C) $n \geq 3$ odd, $a_n < 0$
- B) $n \geq 3$ odd, $a_n > 0$ D) $n \geq 2$ even, $a_n > 0$

Question: 24

Which answer choice is an incorrect statement about functions and their inverses?

- A** The domain values of $f(x)$ are equal to the range values of $f^{-1}(x)$ and the domain values of $f^{-1}(x)$ are equal to the range values of $f(x)$.
- B** The graphs of $f(x)$ and $f^{-1}(x)$ are reflections of each other over the line $y = x$.
- C** To determine the equation for $f^{-1}(x)$, first determine the equation for $f(\frac{1}{x})$ and then solve that equation for x .
- D** The point (b, a) is on the graph of $f^{-1}(x)$ when the point (a, b) is on the graph of $f(x)$.

Question: 25

Which of the following can be a representation of the Law of cosine, for a triangle with sides a, b, c and opposite angles α, β, γ , respectively?

- A) $c^2 = a^2 + b^2 - 2ab \cos(\gamma)$
- B) $a^2 = c^2 + b^2 - 2ab \cos(\gamma)$
- C) $c^2 = a^2 + b^2 - 2ab \cos(\alpha)$
- D) $c^2 = a^2 + b^2 - 2ab \cos(\beta)$

Question: 26

(From Free Response # 3)

Use completing the square method to write the quadratic function below in the form $f(x) = a(x - h)^2 + k$, and give the value of k .

$$y = 2x^2 + 3x - 4$$

- A) $\frac{41}{8}$ B) $-\frac{41}{8}$ C) $\frac{23}{8}$ D) $-\frac{23}{8}$

Question: 27

Determine $\lim_{h \rightarrow 0} \frac{[f(x+h) - f(x)]}{h}$, if $f(x) = 2x^2 - 3x$

- A. $4x - 3 + h$ B. $4x - 3$ C. $4x + 2h - 3x$ D. $4x - 3 + 2h$ E. None

Question: 28

Determine the Period of the trigonometric function below.

$$f(x) = \frac{1}{2} \sin \left(\frac{3}{2}x - \pi \right)$$

- A) $\frac{4}{3} \pi$ B) $\frac{2}{3} \pi$ C) $\frac{3}{4} \pi$ D) $\frac{3}{2} \pi$

Question: 29

If $f(x) = 4^{\frac{x-8}{2}}$ and $g(x) = 3^{2-x}$ determine $f \circ g(x)$:

A) $4^{\frac{3(2-x)-8}{2}}$

C) $4^{\frac{9-8(3^x)}{2(3^x)}}$

B) $4^{\frac{9-8(3^x)}{6^x}}$

D) $2^{\frac{9-8(3^x)}{4(3^x)}}$

Question: 30

If $\frac{1}{3} \log_3 x = 2 \log_3 2$, then $x = ?$

A. 8

B. $\frac{4}{3}$

C. 64

D. 12

Question: 31

Determine if the statement below is true or false about inverse cosine in the first and second quadrants.

“ $y = \cos^{-1}(x)$ means $x = \cos y$, where $-1 \leq x \leq 1$ and $0 \leq y \leq \pi$ ”

A) True

B) Even

C) False

D) Odd

Question: 32

Determine $\frac{f(x+h)-f(x)}{h}$, if $f(x) = 2x^2 - 3x$

A. $4x - 3 + h$

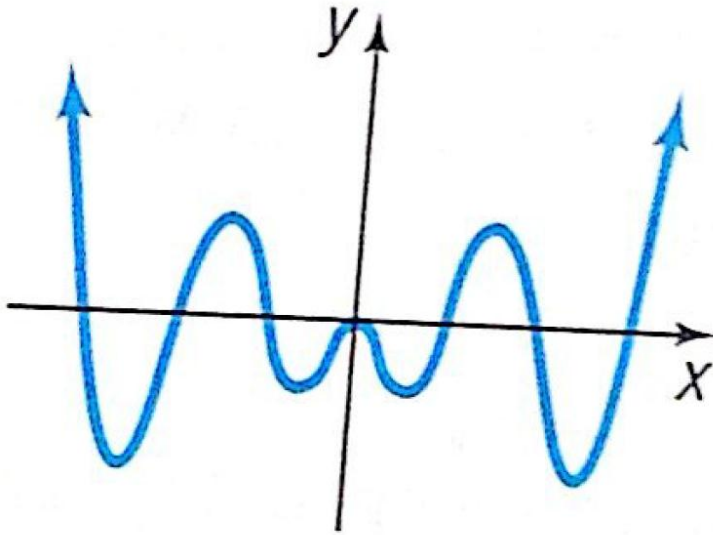
B. $4x - 3$

C. $4x + 2h - 3x$

D. $4x - 3 + 2h$

E. None

Question: 33



For the polynomial above, does the function have any zero with multiplicity greater than 1.

- A) No, it does not. B) Yes, it does C) Not enough information

Question: 34

Find the exact value of the expression below.

$$\sin(-40^\circ)\csc(40^\circ)$$

- A. $\frac{1}{2}$ B. -40 C. -1 D. 1 E. None

Question: 35

$$\text{If } \log_a(3^a) = \frac{a}{2}, \text{ then } a = ?$$

- A) 8 B) 2 C) 27 D) 9

Question: 36

Find the exact value of the trigonometric function below if $\sin \theta = \frac{4}{5}$, for $0^\circ \leq \theta \leq 90^\circ$

$$\tan \theta = ?$$

- A. $\frac{4}{3}$ B. $\frac{3}{5}$ C. 1 D. $\frac{3}{4}$ E. None

Question: 37

From Free response #1:

Is the degree of the polynomial even or odd?

- A) Even B) Odd C) Neither even nor odd

Question: 38

If $3\log_2(x - 1) + \log_2 4 = 5$, then $x = ?$

- A. 3 B. 1 C. 8 D. None

Question: 39

Converting 135° into radians will yield?

- A) $\frac{2}{3}\pi$ B) $\frac{1}{3}\pi$ C) $\frac{3}{4}\pi$ D) $\frac{3}{2}\pi$

Question: 40

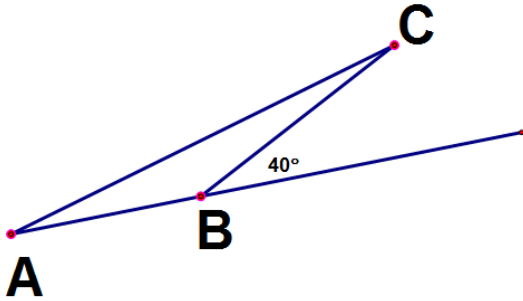
Evaluate the expression below:

$$\log_3 81 + \log_5 125$$

- A) 12 B) 14 C) 8 D) 7

Question: 12 Calculator allowed**

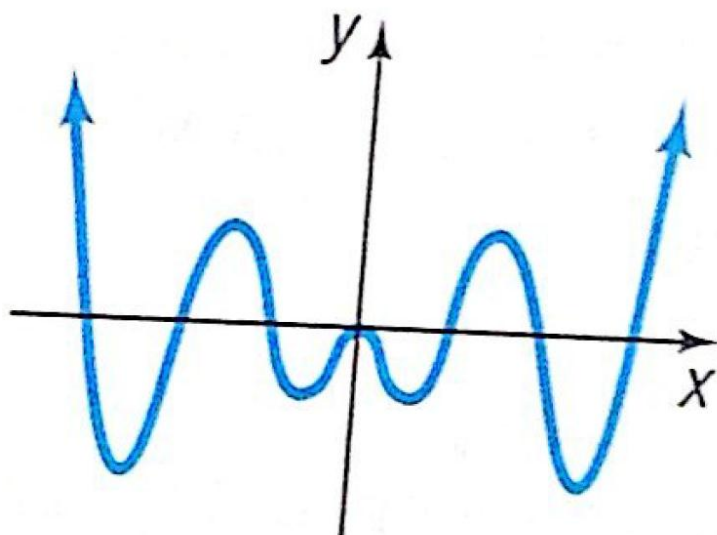
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Free Response Problem #1



- A) Is the degree of the polynomial above even or odd?
- B) Is the leading coefficient of the polynomial above positive or negative?
- C) Is the function above even, odd, or neither?
- D) Why is x^2 necessarily a factor of the polynomial?

Free response Problem #2

Solve for x:

$$3 \cdot 2^x - 30 \cdot 2^{0.5x} + 48 = 0$$

Free response Problem #3

Use completing the square method to write the quadratic function below in the form of: $f(x) = a(x - h)^2 + k$,

$$y = 2x^2 + 3x - 4$$

Free response Problem #4

For the given function $f(x) = 3x^2 + 5x - 4$,

- a) Determine the expression for the difference quotient for f , leave answer in simplest form. $\frac{f(x+h)-f(x)}{h}$

- b) Evaluate the limit of the difference quotient as h approaches zero.

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$