Pre-Calc
Midterm Practice Test

Name KEY
Date 1/7/18 **Period** ____

Choose the best answer.

1.) Evaluate the logarithms. Approximate with a calculator if necessary.

a.) $\ln e^{-7}$ (-7)

b.) $\log_3 27$ (3)

c.) $\log\left(\frac{1}{1000}\right)$ (-3)

d.) $\ln 15$ 2.708

e.) $\log_3 6 = \frac{\log 6}{\log 3} \approx 1.631$

2.) Write as a single logarithm and simplify. Do not evaluate with a calculator.

a.) $2\ln 3 + \ln 4 - \ln 6$ $\ln\left(\frac{3^2 \cdot 4}{6}\right) = \ln\left(\frac{36}{6}\right) = \ln 6$

b.) $\log 12 - 2\log 2 - \log 3$ $\log\left(\frac{\frac{12}{2^2}}{3}\right) = \log 1 = 0$

c.) $\ln(x+1) + \ln(x-1) - 2\ln x$ $\ln\frac{(x+1)(x-1)}{x^2}$

3.) Solve the equations. Give a **simplified answer** and a **decimal approximation** for each.

a.) $e^{2x-1} = 5$ $\ln 5 = 2x - 1$ $\frac{\ln 5 + 1}{2} = x \approx 1.305$

b.) $3^{3p-1} = 25$ $\log_3 25 = 3p - 1$ $p = 1.30998$

c.) $\frac{5e^{x+1}}{5} = \frac{100}{5}$ $e^{x+1} = 20$ $\ln 20 = x + 1$ $\ln 20 - 1 = x$ $x = 1.996$

d.) $\ln x = 4$ $e^4 = x = 54.598$

4.) Krypton-85 is a radioactive isotope of Krypton, with a half-life of 10 years. $y = \left(\frac{1}{2}\right)^{t/10}$

a.) If 12 grams of Krypton-85 leak into a laboratory, give an equation for the amount of Krypton that will be present after t years. $A(t) = 12\left(\frac{1}{2}\right)^{t/10}$

b.) How much will be present after 25 years? 2.1213 grams

5.) The estimated population of the city of Austin is given by the equation $P = 650,000e^{.07t}$ where t is the number of years from now.

a.) What will the population be in 10 years? $1308939.26 \approx 1,308,939$

b.) How long will it take the population to reach 1 million? 6.154 years

6.) Fill in the chart given: $f(x) = \frac{x+3}{x^2-9}$. $= \frac{(x+3)}{(x+3)(x-3)} = \frac{1}{x-3}$

Asymptotes	$x = 3$ $y = 0$
hole(s)	$(-3, -1/6)$
x-int (s)	NONE
y-int	$(0, -1/3)$

7.) Find the partial fraction decomposition of $\frac{2x-1}{(x-5)^2}$.

$\frac{A}{(x-5)} + \frac{B}{(x-5)^2}$ $A = 2$

$A(x-5) + B$

$Ax - 5A + B$

$-5A + B = -1$

$-10 + B = -1$

$B = 9$

$\frac{2}{x-5} + \frac{9}{(x-5)^2}$

8.) Which of the following has a slant asymptote?

a.) $f(x) = \frac{x^5+1}{x^4+3x^2+2}$ slant

b.) $f(x) = \frac{x^2+1}{x^3-x^2-1}$ $y = 0$

c.) $f(x) = \frac{4x^2+x+1}{x^2+2}$ $y = 4$

d.) $f(x) = \frac{x^5+1}{x^6-1}$ $y = 0$

9.) Find the equation of the slant asymptote of the function $f(x) = \dfrac{x^2 - 11x + 30}{x - 4}$.

$x - 7$
$x-4 \;\overline{)\; x^2 - 11x + 30}$
$-\,x^2 - 4x$
$-7x + 30$
$-7x + 28$
2

a.) $f(x) = x - 4$ b.) $f(x) = x + 4$ c.) $f(x) = x - 7$ d.) $f(x) = x + 7$

10.) Which of the following functions has a hole at (1, 4)?

a.) $f(x) = \dfrac{x-1}{(x-1)(x-5)}$ b.) $f(x) = \dfrac{x-1}{(x+1)^2}$

c.) $f(x) = \dfrac{4}{x-1}$ d.) $f(x) = \dfrac{(x-1)(11x+1)}{(x-1)(x+2)}$ $\dfrac{11(1)+1}{1+2} = \dfrac{12}{3} = 4$ ✓

11.) Choose the correct graph of $f(x) = \dfrac{-2x+5}{x-2}$. $x=2$ $y=-2$

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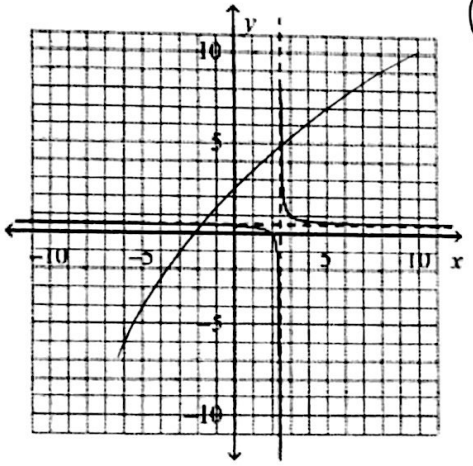

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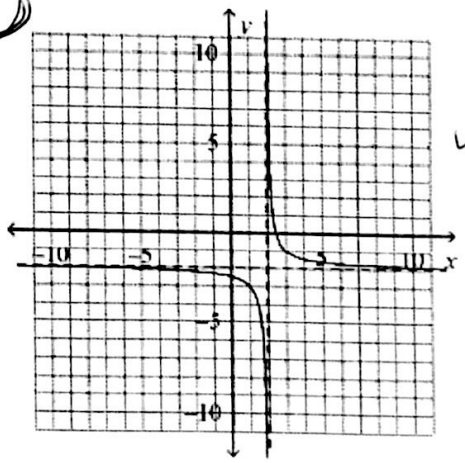

c.)

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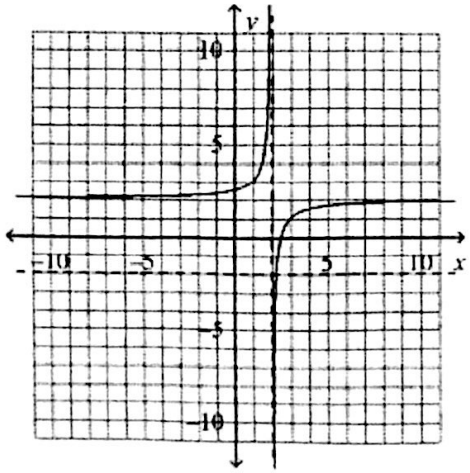

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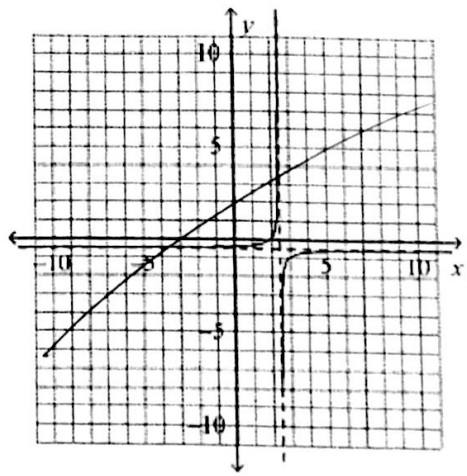

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12.) Which of the following equations describes the partial fraction decomposition of a ration function of the form $f(x)=\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}$?

a.) $\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}=\dfrac{A}{x-1}+\dfrac{B}{(x-1)^2}+\dfrac{C}{x-2}+\dfrac{Dx+E}{x^2+4}$

b.) $\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}=\dfrac{A}{x-1}+\dfrac{B}{(x-1)^2}+\dfrac{C}{x-2}+\dfrac{D}{x^2+4}$

c.) $\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}=\dfrac{A}{x-1}+\dfrac{Bx+c}{(x-1)^2}+\dfrac{D}{x-2}+\dfrac{E}{x^2+4}$

d.) $\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}=\dfrac{A}{x-1}+\dfrac{B}{(x-1)^2}+\dfrac{C}{x-2}+\dfrac{Dx}{x^2+4}$

e.) $\dfrac{x^2+2x+3}{(x-1)^2(x-2)(x^2+4)}=\dfrac{A}{x-1}+\dfrac{Bx}{(x-1)^2}+\dfrac{C}{x-2}+\dfrac{Dx+E}{x^2+4}$

13.) Convert 144° from degrees to radians. $144\cdot\frac{\pi}{180}$

a.) $\dfrac{4\pi}{5}$ b.) $\dfrac{3\pi}{5}$ c.) $\dfrac{8\pi}{5}$ d.) $\dfrac{2\pi}{5}$

14.) Convert $\dfrac{7\pi}{10}$ from radian measure to degree measure. $\frac{7\pi}{10}\cdot\frac{180}{\pi}$

a.) 154.29° b.) 126° c.) $257.14\pi^\circ$ d.) 252°

15.) Use the arc length formula and the given information: $s=18cm,\ \theta=54^\circ$, to find the radius.

$s=r\theta$ $\quad 54\cdot\frac{\pi}{180}=\frac{3\pi}{10}$

$18=\frac{3\pi r}{10}$

a.) $\dfrac{30}{\pi}cm$ b.) $\dfrac{120}{\pi}cm$ c.) $\dfrac{60}{\pi}cm$ d.) $\dfrac{1}{3}cm$

$\frac{180}{3\pi}=\frac{3\pi r}{3\pi}$ $\quad \frac{60}{\pi}$ ✓

16.) The radius of a car wheel is 15 inches. How many revolutions per minute is the wheel making when the car is traveling 30 mph. Round your answer to the nearest revolution.

a.) 3318 *rpm* b.) 9 *rpm* c.) 336 *rpm* d.) 2101 *rpm*

$\frac{30\text{ mites}}{\text{hr}}\cdot\frac{1\text{ rev}}{30\pi\text{ in}}\cdot\frac{12\text{ in}}{1\text{ ft}}\cdot\frac{5280\text{ ft}}{1\text{ mile}}\cdot\frac{1\text{ hr}}{60\text{ min}}=336$

17.) Find the value of the unique real number θ between 0 and 2π that satisfies the given condition:

$$\tan\theta = 1 \text{ and } \sin\theta < 0$$

a.) $\frac{7\pi}{4}$ b.) $\frac{5\pi}{4}$ c.) $\frac{3\pi}{4}$ d.) $\frac{7\pi}{6}$

18.) Use a calculator to evaluate $\cos 0.2261$. Round your answer to 4 decimal places.

a.) 0.2300 b.) 1.026 c.) 0.2242 d.) 0.9745

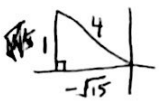
19.) Give the exact value of $\cos 150^\circ$.

a.) $\frac{\sqrt{3}}{2}$ b.) $\frac{\sqrt{2}}{2}$ c.) $-\frac{\sqrt{3}}{2}$ d.) $-\frac{\sqrt{2}}{2}$

c.) Find $\tan\theta$ if $\cos\theta = \frac{1}{4}$ and $\sin\theta < 0$.

a.) 4 b.) $\frac{-\sqrt{15}}{15}$ c.) $-\sqrt{17}$ d.) $-\sqrt{15}$

21.) Find $\csc\theta$ if $\cot\theta = -\sqrt{15}$ and $\cos\theta < 0$.



a.) $-\frac{1}{4}$ b.) $\frac{1}{4}$ c.) 4 d.) -4

22.) Simplify the expression: $\cos\theta - \cos\theta\sin^2\theta$. $\cos\theta(1-\sin^2\theta) = \cos\theta \cdot \cos^2\theta$

a.) $\sec^2\theta$ b.) $\tan^2\theta$ c.) $\cos^3\theta$ d.) $\sin\theta$

b.)

23.) Simplify the expression: $\dfrac{\cos^2 x + \sin^2 x}{\cot^2 x - \csc^2 x}$. $= \dfrac{1}{-1}$

a.) $\csc x$ b.) -1 c.) 1 d.) $\sec x$

24.) Simplify the expression: $\cos x + \sin x \tan x$. $\dfrac{\cos x \cdot \cos x}{\cos x} + \dfrac{\sin x \cdot \sin x}{\cos x}$

a.) $\tan x - 1$ b.) $\csc x$ c.) $\cot x - 1$ d.) $\sec x$

25.) Rewrite each expression in factored form: $\sin^2 x + \sin x - 2$. $(\sin x + 2)(\sin x - 1)$

a.) $(\sin x + 2)(\sin x + 1)$ b.) $(\sin x - 2)(\sin x - 1)$

c.) $(\sin x - 2)(\sin x + 1)$ d.) $(\sin x + 2)(\sin x - 1)$

26.) Simplify the expression: $\dfrac{\sin^2 x - 1}{1 + \sin x}$. $= \dfrac{(\sin x + 1)(\sin x - 1)}{1 + \sin x}$

a.) $-\cos x$ b.) $\sin x - 1$ c.) $\sin^2 x + 1$ d.) $\sin x + 1$

27.) Identify the amplitude, period, and phase shift: $y = 5\cos\left(3x + \dfrac{\pi}{2}\right)$. TSBOT (if graphed)

$A = 5$ $P = \dfrac{2\pi}{b}$ $P = \dfrac{2\pi}{3}$

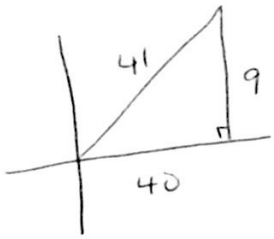
$3x + \dfrac{\pi}{2} = 0$ $\dfrac{3x}{3} = -\dfrac{\pi}{2} \cdot \dfrac{1}{3}$ $x = \dfrac{-\pi}{6}$

28.) Find the exact value of y.

a.) $y = \sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ $\dfrac{\pi}{3}$

b.) $y = \arctan(1)$ $\dfrac{\pi}{4}$

29.) Find the remaining 5 trig ratios if $\tan\theta = \frac{9}{40}$ (in Quadrant I).



$\sin\theta = \frac{9}{41}$ $\quad \csc\theta = \frac{41}{9}$

$\cos\theta = \frac{40}{41}$ $\quad \sec\theta = \frac{41}{40}$

$\tan\theta = \frac{9}{40}$ $\quad \cot\theta = \frac{40}{9}$

30.) Find two coterminal angles, one positive and one negative, with $\frac{\pi}{9}$.

$\frac{\pi}{9} + 2\pi = \frac{19\pi}{9}$ $\qquad \frac{\pi}{9} - 2\pi = \frac{-17\pi}{9}$

31.) A ferris wheel with a diameter of 225 feet takes 44 seconds to rotate once.

a.) Determine the angular velocity in rad/sec of the ferris wheel.

$\frac{1\text{rev}}{44\text{sec}} \cdot \frac{2\pi\text{rad}}{1\text{rev}} = .143\ \text{rad/sec}$

b.) Determine the linear velocity in ft/sec of the ferris wheel.

$\frac{1\text{rev}}{44\text{sec}} \cdot \frac{225\pi\ \text{ft}}{1\text{rev}} \approx 16.065\ \text{ft/sec}$

32.) Identify the amplitude, period, and phase shift: $y = 5\cos\left(3x + \frac{\pi}{2}\right)$.

Same as 27

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