Kuwait university | Math 91 (Pre Calculus) | August 6, 2017

Dept. of Mathematics | Final Exam | Duration: 2 hours

Student Name:_____ Student No.: _____

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1. Simplify $|e^2 - 9|$.

   (a) $e^2 - 9$ (b) $e^2 + 9$ (c) $9 - e^2$ (d) None of the previous

2. Simplify $\dfrac{\frac{3}{4} + \frac{1}{3}}{\frac{7}{3} - \frac{1}{6}}$.

   (a) 2 (b) $\frac{1}{2}$ (c) $\frac{9}{14}$ (d) $\frac{-2}{7}$

3. Simplify $(3x^4 + 5x^2 - 6x) - (2x^2 + 4x + 5)$.

   (a) $x^4 + x^2 - x$ (b) $x^4 + 3x^2 + 2x + 5$

   (c) $3x^4 + 3x^2 - 2x + 5$ (d) $3x^4 + 3x^2 - 10x - 5$

4. Find the solution set of the inequality $\frac{x-2}{x+3} \geq 0$.

   (a) $(-\infty, -3) \cup [2, \infty)$ (b) $(-3, 2]$

   (c) $[-3, 2)$ (d) $(-\infty, -3] \cup (2, \infty)$

5. Find an equation of the line passing through the point $P(-2, 5)$ and parallel to the line $2y + 4x - 1 = 0$.

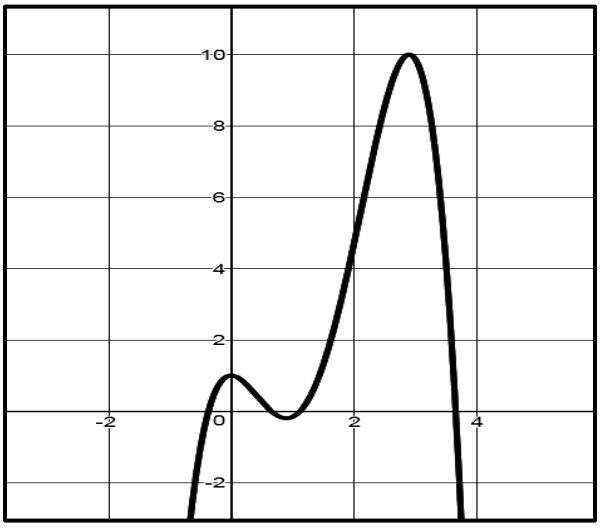
   (a) $x + 2y - 8 = 0$ (b) $2x + y - 1 = 0$

   (c) $x - 2y + 12 = 0$ (d) $2x - y + 9 = 0$

6. Find the solution of the equation $x^2 = 6x - 1$.

   (a) -1 and -5 (b) $3 \pm 2\sqrt{2}$ (c) -1 and 7 (d) $6 \pm \sqrt{6}$

7. Given the graph of a function. Find the values of *x* for which it has a local maximum.



   (a) 0 and 3

   (b) 1 and 10

   (c) 0 and 1

   (d) 3 and 10

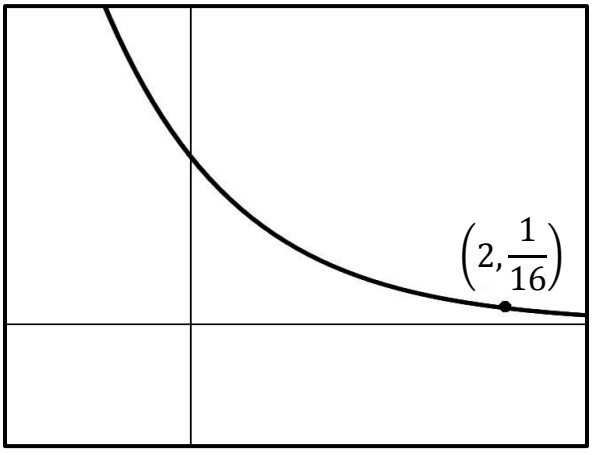
8. What is the remainder of dividing $P(x) = x^3 + 3x^2 - 7x + 6$ by $x - 2$?

   (a) 24 (b) 2 (c) 12 (d) 0

9. If $C = -3$ is a zero of $P(x) = x^3 + 4x^2 + x - 6$. Find the other real zeros.

   (a) 1 and 3 (b) -1 and 2 (c) -2 and 1 (d) -1 and 3

10. Which of the following functions represents the given graph?



   (a) $y = 8^{-x}$

   (b) $y = 8^x$

   (c) $y = 4^{-x}$

   (d) $y = 4^x$

11. Find the domain of $y = \ln(x + 5)$.

(a) $\mathbb{R}/\{5\}$ (b) $(-\infty, -5)$ (c) $\mathbb{R}$ (d) $(-5, \infty)$

12. Use the laws of logarithm to combine the expression as one logarithmic function.

$\ln(a + 2b) - \ln(a - 2b) - 2\ln c$

(a) $\ln \frac{(a+2b)\, c^2}{(a-2b)}$ (b) $\ln \frac{(a+2b)}{(a-2b)c^2}$

(c) $\ln \frac{4b}{c^2}$ (d) $\ln \frac{a^2-4b^2}{c^2}$

13. Find the solution of the equation $3^{x-2} = 5$.

(a) $2 + \log_5 3$ (b) $\frac{1}{2}\log_3 5$

(c) $-\log_5 6$ (d) $2 + \log_3 5$

14. If $f(x) = \ln(x) + 1$. Find $f(e^{2x-6})$.

(a) $2x - 5$ (b) e^{2x-5}

(c) $e^{2x} - 5$ (d) $\ln(2x) - 5$

15. Convert the angle $\theta = \frac{3\pi}{4}$ to degrees measure.

(a) $45°$ (b) $135°$ (c) $120°$ (d) $150°$

16. Find the exact value of $\tan \frac{5\pi}{6}$.

(a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$ (c) $\frac{-1}{\sqrt{3}}$ (d) $-\sqrt{3}$

17. Given that θ is an angle in the third quadrant, and $\cos\theta = \frac{-3}{5}$. Find $\sin\theta$.

(a) $\frac{-5}{3}$ (b) $\frac{-4}{5}$ (c) $\frac{5}{4}$ (d) $\frac{4}{3}$

18. Simplify the expression $\frac{\sin x + \tan x}{\tan x}$.

(a) $1 + \cos x$ (b) $1 + \sin x$

(c) $\sin x$ (d) $\cos x$

19. Which of the following equations represents an equation of **ellipse**?

(a) $\frac{x^2}{4} + \frac{y}{9} = 1$ (b) $\frac{x^2}{4} + \frac{y^2}{9} = 1$

(c) $x = \frac{y^2}{9}$ (d) $\frac{x}{4} + \frac{y^2}{9} = 1$

20. What are the vertices of the **hyperbola** whose equation is $\frac{x^2}{16} - \frac{y^2}{25} = 1$?

(a) $(0, -5)$ and $(0,5)$ (b) $(-5,0)$ and $(5,0)$

(c) $(-4, -5)$ and $(4,5)$ (d) $(-4,0)$ and $(4,0)$

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Solve each of the following questions:

1. (5 points) Solve the logarithmic equation $\log_9(x-5)+\log_9(x+3)=1$.

Ans:

$\log_9[(x-5)(x+3)]=1 \quad \Rightarrow \quad (x-5)(x+3)=9 \quad \Rightarrow$

$x^2-2x-15=9 \quad \Rightarrow \quad x^2-2x-24=0 \quad \Rightarrow \quad (x-6)(x+4)=0$

$\Rightarrow \quad x=6 \text{ or } x=-4$

Check:

at $x=6$: $\log_9(6-5)+\log_9(6+3)=1 \quad \Rightarrow \quad \log_9(1)+\log_9(9)=1$

at $x=-4$: $\log_9(-4-5)+\log_9(-4+3)=1$

$\Rightarrow \quad \log_9(-10)+\log_9(-1)=1$ Rejected

$\Rightarrow \quad S=\{6\}$

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2. (5 points) Find the solution set of the equation $2\cos\theta\sin\theta+\sin\theta=0$ in the interval $[0,2\pi)$.

Ans:

$\sin\theta\,(2\cos\theta+1)=0 \quad \Rightarrow \quad \sin\theta=0 \quad \text{OR} \quad 2\cos\theta+1=0$

$\sin\theta=0 \quad \Rightarrow \quad \theta=0 \quad \text{or} \quad \theta=\pi$

$2\cos\theta+1=0 \quad \Rightarrow \quad \cos\theta=\dfrac{-1}{2}$

Reference angle: $\hat{\theta}=\frac{\pi}{3}=60°$, and the negative sign means that the angle is either is the second or third quadrants. Therefore,

In the 2nd quadrant: $\theta=\pi-\frac{\pi}{3}=\frac{2\pi}{3}$

In the 3rd quadrant: $\theta=\pi+\frac{\pi}{3}=\frac{4\pi}{3}$

$\Rightarrow \quad S=\left\{0, \quad \pi, \quad \dfrac{2\pi}{3}, \quad \dfrac{4\pi}{3}\right\}$

3. (5 points) Divide $P(x) = 8x^4 + 4x^3 + 6x^2 + 5$ by $D(x) = 2x^2 + 1$.

	$4x^2$	$+ 2x$	$+1$		
$2x^2 + 1$	$8x^4$	$+ 4x^3$	$+ 6x^2$	$+ 5$	
	$8\,x^4$		$+ 4x^2$		
		$4x^3$	$+ 2x^2$		$+ 5$
		$4x^3$		$+ 2x$	
			$2x^2$	$- 2x$	$+ 5$
			$2x^2$		$+ 1$
				$- 2x$	$+ 4$

$$\frac{8x^4 + 4x^3 + 6x^2 + 5}{2x^2 + 1} = 4x^2 + 2x + 1 + \frac{-2x + 4}{2x^2 + 1}$$

Answer Key**:**

Q	Answer	Q	Answer
1	C	11	D
2	B	12	B
3	D	13	D
4	A	14	A
5	B	15	B
6	B	16	C
7	A	17	B
8	C	18	A
9	C	19	B
10	C	20	D