

Instructor: _____

Date: December 16, 2003

1. There are 13 pages(counting this page) and 3 pages for scratch work at the end.
2. No graphing or programmable calculators are allowed. Scientific calculators are allowed but are not needed.
3. Give exact answers (fractions, square roots, etc.). Decimal approximations may not receive full credit.
4. No notes or books are allowed.
5. Use only the scratch paper provided.
6. In Part II show your work and make your methods clear. Unjustified answers will receive no credit.

Part	Problems	possible scores	your score
I	1-10	6 each	
II	1	9	
	2	9	
	3a, 3b	9, 9	
	4	9	
	5	11	
	6	11	
	7	11	
	8a, 8b	10, 10	
	9a, 9b	9, 9	
III	1-4	6 each	
	TOTAL	200	

Part I. Multiple Choice - Circle the correct answer. There is no penalty for guessing. 6 points each.

1. If F is a linear function for which $F(2) = 6$ and $F(-6) = -2$ then $F(10)$ equals

- a) 10 b) 30 c) 14 d) -10

2. When $x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x$ is divided by $x - i$ the remainder is:

- a) i b) $-i$ c) 1 d) -1

3. The equation $x^3 + 2x^2 - x - 2 = 0$ has a root at $x = 1$. The other roots of the equation are

- a) -1, -2 b) -1, 2 c) 1, -2 d) 1, 2

4. Find the value of $h > 0$ such that the average rate of change of $f(x) = 2x^2 - 3x$ on $[2, 2 + h]$ is 13.

- a) 13 b) -9 c) 2 d) 4

5. If (x, y) is the solution of the system of equations:

$$x + 3y = 21$$

$3x + 3y = -15$ then $x - y$ is equal to

- a) -6 b) -31 c) 6 d) -16

6. If $f^{-1}\left(\frac{2t+1}{2t-3}\right) = 7$ and $f(7) = 6$ then $t =$
- a) $\frac{13}{9}$ b) $\frac{19}{10}$ c) $\frac{15}{11}$ d) $\frac{22}{12}$

7. The expression $4\log_5 x - 6\log_5(x^2 + 1)$ equals

- a) $-2\log_5(x - x^2 + 1)$ b) $\log_5\left(\frac{x^4}{(x^2 + 1)^6}\right)$
- c) $\frac{2\log_5 x}{3\log_5(x^2 + 1)}$ d) $4\log_5\left(\frac{x}{(x^2 + 1)^6}\right)$

8. The complex number $i^3 - i^4 + \frac{2}{i}$ is equal to

- a) $1 + 3i$ b) $1 - 3i$ c) $3i - 1$ d) $-1 - 3i$

9. Solve for x when $\log_9\left(\frac{\sqrt{3}}{81}\right) = 9x + 9$

- a) $\log\left(\frac{\sqrt{3}}{81}\right)$ b) $-\frac{43}{36}$ c) $\frac{\log\left(\frac{\sqrt{3}}{81}\right)}{9}$ d) $-\frac{71}{72}$

10. $\sum_{n=5}^{26} (-43 + 5n) =$

- a) 1755 b) 897 c) 759 d) 484

Part II Show all work.

1. (9 points) For what value(s) of a will the parabola $y = -x^2 + ax + 7$ have a maximum value of 10. Simplify as much as possible.

ans

2. (9 points) Find a quadratic equations with the given roots, $r_1 = 5 - 6i$, $r_2 = 5 + 6i$. Write your answer in the form $Ax^2 + Bx + C = 0$.

ans

3(a). (9 points) Solve the inequality $\ln(x) + \ln(x - 3) \leq \ln 10$

ans

3(b) (9 points) Solve the inequality $7(10 - 3^x) < 20$

ans

4. (9 points) At what points do the parabola $5y = 6x^2$ and the circle $x^2 + y^2 = 1$ intersect?

ans

5. (11 points) Solve the system of linear equations.

$$x + y + z = 3$$

$$x - 2y + 4z = 5$$

$$3y + 4z = 5$$

ans

6. (11 points) Jean-Claude Van Damme is looking for someone to save when he notices two trains that are 250 miles apart and heading towards each other on the same track. If one train is traveling 13 miles per hour faster than the second train and they are going to collide in exactly 3 hours and 30 minutes, what is the velocity of the slower train?

ans

7. (11 points) Solve the inequality: $\left| \frac{x+2}{x-3} \right| < 1$.

ans

8. Solve the following equations for x .

a) (10 points) $4x^{1/3} - 15x^{2/3} = 4$

ans

b) (10 points) $4x - \sqrt{1 - 7x} = 0$

ans

9a) (9 points) Sum the series $\pi - \frac{\pi^2}{\sqrt{11}} + \frac{\pi^3}{11} + \frac{\pi^4}{11\sqrt{11}} + \dots$

ans

9b) (9 points) How long will it take an initial deposit of \$435 to grow to \$750 if it is left in an account that pays 1.25% interest per annum and is compounded daily?

ans

Part III. Basic and Fraction Review Problems. (6 points each).

1. Simplify as much as possible.

$$\sqrt[3]{2} - \sqrt[3]{-128} - \sqrt[3]{-250}$$

ans

2. Carry out the indicated operation and simplify as much as possible.

$$\frac{\sqrt{x+a}}{\sqrt{x-a}} - \frac{\sqrt{x-a}}{\sqrt{x+a}}$$

ans

3. Simplify as much as possible.

$$\left[\frac{x+1}{\frac{1}{x}+1} \right]^{-2}$$

ans

4. Carry out the indicated operation and simplify as much as possible.

$$\frac{(a^3)^4 a^{-4} b + (a^{-1})^2 a^8 b^2}{a^6 b^{-1}}$$

ans

SCRATCH PAPER

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