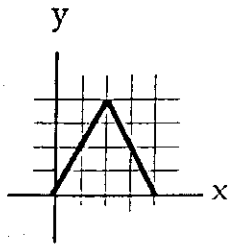
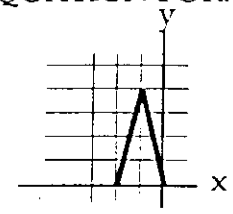
JANUARY 11, 1992 REGIONAL COMPETITION - PRECALCULUS INDIVIDUAL TEST

1. GIVEN THE GRAPH OF $y = f(x)$:



WHICH OF THE FOLLOWING IS THE EQUATION FOR:



a) $y = -\frac{1}{2} f(x)$ b) $y = f(-\frac{1}{2} x)$

c) $y = -2 f(x)$ d) $y = f(-2x)$ e) NOTA

2. HOW MANY DISTINGUISHABLE ARRANGEMENTS ARE THERE FOR THE LETTERS IN "BESTSELLER" ?

a) $10!$ b) $\frac{10!}{3!}$ c) $\frac{10!}{3!\,4!}$ d) $\frac{10!}{3!\,2!\,2!}$ e) NOTA

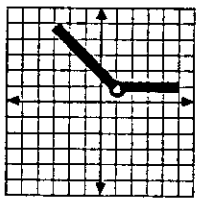
3. HOW MANY DIFFERENT PROM COMMITTEES CONSISTING OF THREE SENIORS AND 5 JUNIORS COULD BE CHOSEN FROM THE MEMBERS OF THE JUNIOR AND SENIOR BOARDS WHICH HAVE EIGHT MEMBERS EACH ?

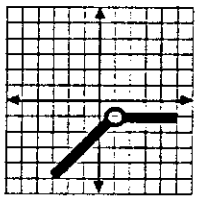
a) 112 b) 3136 c) 7056 d) 2,257,920 e) NOTA

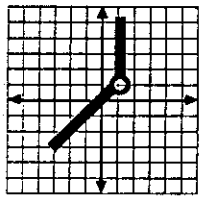
4. IF $\log_n 2 = 0.21$, $\log_n 3 = 0.36$ and $\log_n 5 = 0.54$, FIND $\log_5 6$.

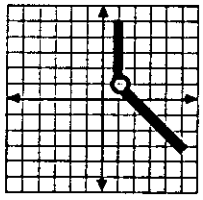
a) $(0.21) + (0.36) - 0.54$ b) $(0.21)(0.36) - 0.54$ c) $\frac{(0.21) + (0.36)}{0.54}$ d) $\frac{(0.21)\ (0.36)}{0.54}$ e) NOTA

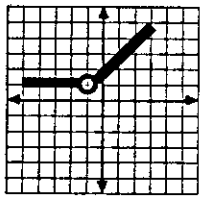
5. GIVEN THE GRAPH OF $y = f(x)$ AT THE RIGHT
WHICH OF THE FOLLOWING IS THE GRAPH OF $y = f^{-1}(x)$?



a) 

b) 

c) 

d) 

e) NOTA

6. IF y VARIES DIRECTLY AS THE SQUARE OF x AND INVERSELY AS BOTH z AND w, HOW IS THE VALUE OF y AFFECTED IF x IS MULTIPLIED BY FOUR AND z AND w ARE BOTH DOUBLED?

a) NO CHANGE b) y IS DOUBLED c) y IS MULTIPLIED BY FOUR
d) y IS MULTIPLIED BY 16 e) NOTA

7. FIND THE COORDINATES OF THE VERTEX OF THE PARABOLA WHOSE EQUATION IS $y = 2x^2 + 6x + 8$.

a) $(-\frac{3}{2}, \frac{7}{2})$ b) $(\frac{3}{2}, \frac{7}{2})$ c) $(-\frac{3}{2}, \frac{23}{4})$ d) $(\frac{3}{2}, -\frac{23}{4})$ e) NOTA

8. WHICH OF THE FOLLOWING ANGLE MEASURES IS NOT COTERMINAL WITH AN ANGLE WHOSE MEASURE IS $-428°$?

a) $-1148°$ b) $-68°$ c) $68°$ d) $292°$ e) NOTA

9. WHAT IS THE SIGN OF THE COSINE OF THE ARBITRARY REAL NUMBER 24 ?

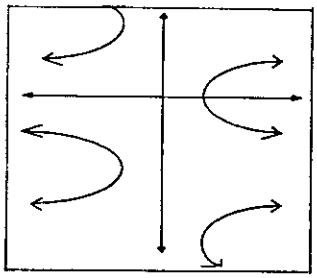
a) POSITIVE b) NEGATIVE c) NOTA

10. IF $\sin A = \frac{3}{4}$ AND $0 < A < \frac{\pi}{2}$ FIND THE COSINE OF THE SUPPLEMENT OF A.
a) $-\frac{\sqrt{7}}{4}$ b) $\frac{\sqrt{7}}{4}$ c) $-\frac{5}{4}$ d) $\frac{5}{4}$ e) NOTA

11. GIVEN ΔABC WITH $\angle A = 75°$, $\angle B = 30°$ AND $b = 2$, FIND a.
a) 4 b) $\sqrt{2} - \sqrt{6}$ c) $\sqrt{2} + \sqrt{6}$ d) $\frac{\sqrt{2} + \sqrt{6}}{4}$ e) NOTA

12. GIVEN $\sin x = \frac{2}{3}$ AND $\frac{-\pi}{2} < x < \pi$, FIND $\cos 3x$.
a) $-\sqrt{5}$ b) $\frac{7\sqrt{5}}{27}$ c) $\frac{1 - 3\sqrt{5}}{9}$ d) $\frac{4\sqrt{2} - \sqrt{5}}{4}$ e) NOTA

13. WHICH OF THE FOLLOWING IS THE EQUATION OF THE GRAPH SHOWN AT THE RIGHT ?
a) $y = \sec x$ b) $y = \csc x$ c) $x = \sec y$ d) $x = \csc y$ e) NOTA



14. GIVE THE PHASE SHIFT OF:
$y = \sin(4x - 2)$.
a) 2 RIGHT b) 2 LEFT c) $\frac{1}{2}$ RIGHT d) $\frac{1}{2}$ LEFT e) NOTA

15. FIND THE REMAINDER WHEN $x^3 - x^2 - x + 9$ IS DIVIDED BY $x + 2$.
a) 0 b) 1 c) -1 d) 11 e) NOTA

16. FIND THE SUM OF THE ROOTS OF THE EQUATION: $\frac{3}{x + 2} + \frac{12}{x^2 - 4} = \frac{x}{x - 2}$
a) -1 b) 1 c) 3 d) 5 e) NOTA

17. EVALUATE $|3 - 2i|$.
a) $\sqrt{13}$ b) $\sqrt{5}$ c) 5 d) 1 e) NOTA

18. WHICH OF THE FOLLOWING STATEMENTS IS TRUE FOR ANY REAL NUMBER, x ?
a) $-x < 0$ b) $\sqrt{x} > 0$ c) $\sqrt[5]{x^3} > 0$ d) $\frac{x}{x} > 0$ e) NOTA

19. WHICH FIELD PROPERTY IS ILLUSTRATED BY THE STATEMENT:
$z(a + b) + c = (a + b)z + c$?
a) ASSOCIATIVE PROPERTY FOR ADDITION
b) COMMUTATIVE PROPERTY FOR ADDITION
c) COMMUTATIVE PROPERTY FOR MULTIPLICATION
d) DISTRIBUTIVE PROPERTY FOR MULTIPLICATION OVER ADDITION
e) NOTA

20. GIVEN $A = \{1,2,3,4,5\}$, $B = \{2,4,6,8,0\}$ AND $C = \{0,3,6,9\}$, WHICH OF THE FOLLOWING IS EQUAL TO $A \cup B$.

a) $(A \cup B) \cap (A \cup C)$ b) $(A \cap B) \cup (A \cup C)$ c) $(A \cup B) \cup (A \cap C)$
d) $(A \cap B) \cap (A \cap C)$ e) NOTA

21. FIND THE CROSS-SECTIONAL AREA OF A CYLINDRICAL PIPE WITH INNER DIAMETER OF FOUR INCHES AND OUTER DIAMETER OF TEN INCHES.

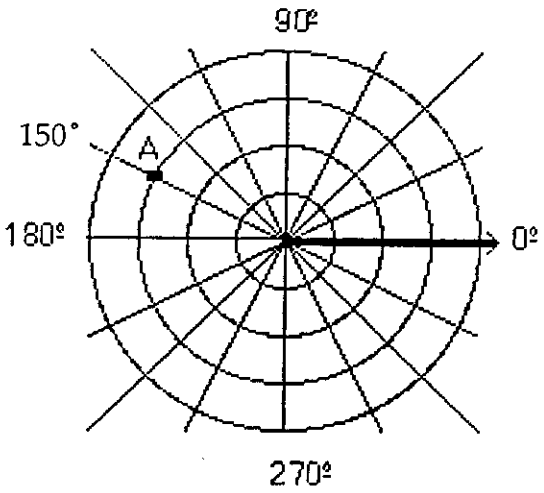
a) 9π b) 21π c) 84π d) 96π e) NOTA

22. THE GRAPH OF WHICH OF THE FOLLOWING EQUATIONS HAS EXACTLY ONE POSITIVE x-INTERCEPT ?

a) $f(x) = x^3 + x^2 + x + 1$
b) $f(x) = x^4 + x^3 + x^2 + x + 1$
c) $f(x) = -x^5 + x^4 + x^3 + x^2 + x + 1$
d) $f(x) = x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$
e) NOTA

23. WHICH OF THE FOLLOWING COULD NOT POSSIBLY BE THE COORDINATES OF POINT A, WHICH IS GRAPHED AT THE RIGHT ?

a) $(-3, -30°)$ b) $(-3, 330°)$ c) $(3, 150°)$
d) $(3, -150°)$ e) NOTA



24. EVALUATE $\cos(\text{Tan}^{-1}(-\frac{4}{3}))$.

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

25. FIND THE COODINATES OF A POINT AFTER 8 SECONDS IF THE POINT TRAVELS COUNTER-CLOCKWISE AROUND A CIRCLE WITH CENTER AT THE ORIGIN AND RADIUS OF 10. THE POINT STARTS AT (10,0) AND TRAVELS AT A SPEED OF ONE-THIRD π RADIANS PER SECOND.

a) $(5, 5\sqrt{3})$ b) $(-5, 5\sqrt{3})$ c) $(-5, -5\sqrt{3})$ d) $(5, -5\sqrt{3})$ e) NOTA

26. WHICH LOG STATEMENT COULD BE USED TO SOLVE THE PROBLEM: $\frac{20^3}{(\sqrt{8})(38)}$

a) $3\log 20 - \frac{1}{2}\log 8 + \log 38$ b) $3\log 20 - \frac{1}{2}\log 8 - \log 38$
c) $\log 3(20) - \log_{\frac{1}{2}}(8) + \log 38$ d) $\log 60 - (\log 4 + \log 38)$ e) NOTA

27. FIND THE SUM OF THE SOLUTION(S) FOR: $x - 13\sqrt{x} + 36 = 0$.

a) 5 b) 13 c) 81 d) 97 e) NOTA

28. SIMPLIFY $(64)^{-\frac{2}{3}}$

a) -16 b) 16 c) $-\frac{1}{16}$ d) $\frac{1}{16}$ e) NOTA

29. WHICH OF THE FOLLOWING IS THE SMALLEST, POSITIVE INTEGER THAT IS AN UPPER BOUND OF:

$x^3 + 6x^2 - 8x + 3$?

a) 1 b) 2 c) 3 d) 4 e) NOTA

30. FIND THE FIRST TERM IN THE EXPANSION OF: $\sum_{k=3}^{5} 2(-3)^{k-1}$.

a) -54 b) 2 c) 18 d) 162 e) NOTA

<- The End ->