Math Placement Test

Sample Questions

1) The equality $(a-b)^2 = a^2 + b^2$ holds:

a) For every a and b
b) Only when a=b
c) When b=0 or a=0
d) Impossible to determine

2) The equality $(a+b)^3 = a^3 + 3ab + b^3$:

a) Is always true
b) Is false
c) Is true when a + b = 1 or ab = 0
d) Impossible to determine

3) $\frac{8^{31}}{4^{39}} =$

a) 4^{-8}
b) 2^{-8}
c) 2^{15}
d) 8^2

4) The lowest possible value of the expression $x \cdot (x-6) + 12$ is

a) 3
b) 6
c) 12
d) 0

5) Which values of x fulfill the inequality $x^2 + x + 1 < 0$?

a) $x < -1 \; or \; 1 < x$
b) $-1 \leq x \leq 1$
c) All values of x
d) No such value exists

6) Solve the inequality $|x| \geq 5$:

a) $5 \leq x$
b) $x \leq -5$
c) $-5 \leq x \leq 5$
d) $x \leq -5 \; or \; 5 \leq x$

7) $\log_2 10 - \log_2 5 =$

a) $\log_2 5$
b) 1
c) $\log_5 2$
d) None of the above

8) Solve the inequality $\log_{10} x < \frac{1}{2}$

a) $x < \frac{1}{2}$

b) $0 < x < \sqrt{10}$

c) $\sqrt{10} < x$

d) $\frac{1}{2} < x$

9) Solve the equation: $\sin x = \frac{\sqrt{3}}{2}$ given that x is in the 1st quadrant:

a) $30°$

b) $45°$

c) $60°$

d) $90°$

10) $sin^2 \frac{\pi}{6} + cos^2 \frac{\pi}{6} =$

a) 1.5

b) $\sqrt{3}$

c) $\frac{1}{4}$

d) 1

11) $\tan \frac{\pi}{2} =$

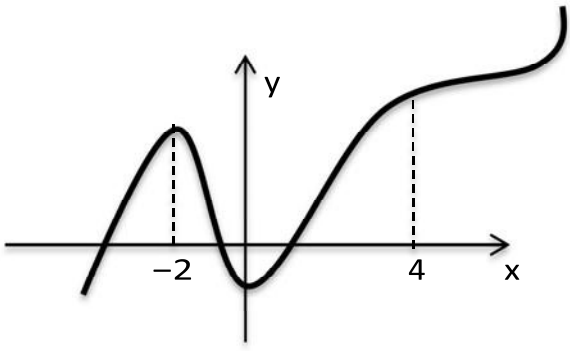
a) 1

b) $\sqrt{3}$

c) $\frac{1}{\sqrt{3}}$

d) Undefined

12) For which values of x is the following function increasing?



a) $x < -2 \; or \; 0 < x < 4$

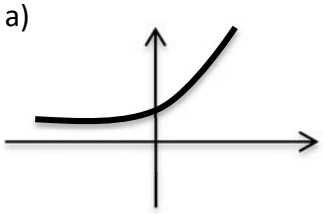
b) $x < 0$

c) $-2 < x < 0$

d) $x < -2 \; or \; 0 < x$

13) Which graph represents the function $y = e^x$?

a)



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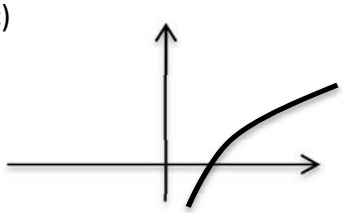

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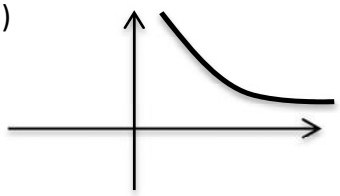

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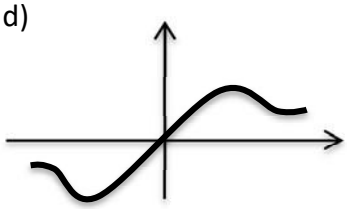
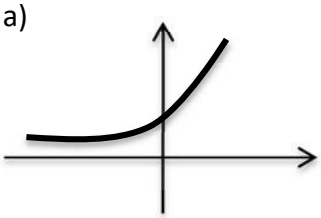


14) Which graph represents the function $y = \ln x$?

a)



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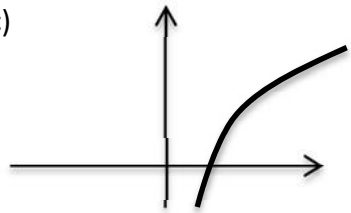

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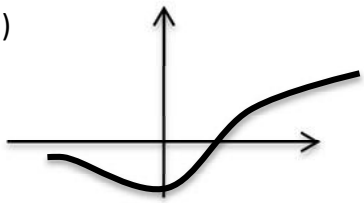

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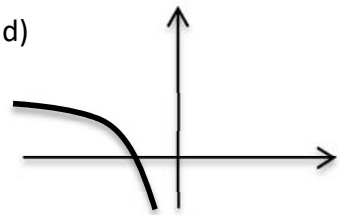
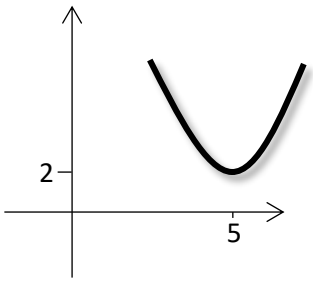


15) Which graph represents the function $y = (x-5)^2 + 2$?

a)



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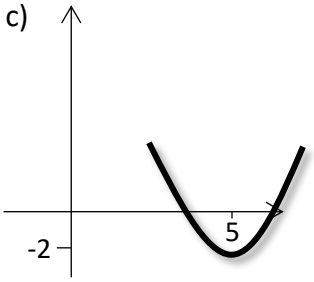

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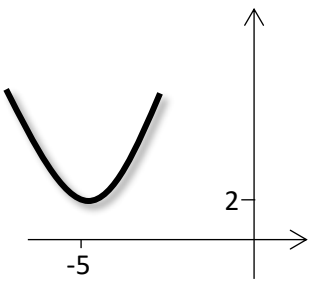
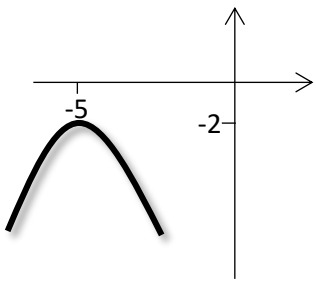


d)



16) Calculate without a calculator: $\sqrt[3]{2}\cdot\sqrt[3]{5}\cdot\sqrt[3]{12.5}=$

a) 2 c) 1

b) 5 d) 100

17) Calculate without a calculator: $\frac{\sqrt{2}}{\sqrt[5]{256}}\cdot\sqrt[10]{128}\div\frac{2}{\sqrt[5]{4}}=$

a) 0.5 c) 1

b) 16 d) 4

18) The equation of the tangent line to the graph of the function $y=x^3$, for $x=-1$, is:

a) $y=x$ c) $y=3x+2$

b) $y=-3x-3$ d) $y=3x+4$

19) If $x=2$ and $y=3$ then $\frac{9x^2-4y^2}{3x+2y}=$

a) 1 c) 6

b) 12 d) 0

20) The system of equations $\begin{cases} y=x+1 \\ y+7x=17 \end{cases}$

a) Has one solution c) Has two solutions

b) Has no solution d) Has infinite solutions

21) The value of the expression $\sin x+\cos x+3$ is:

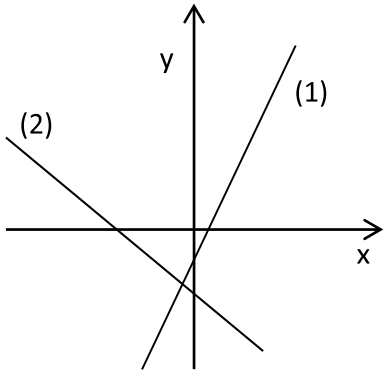
a) Always less than 1 c) Always more than 1

b) Always more than 2 d) Impossible to determine

22) What is true regarding the matching of lines (1) and (2) in the given graph and the two functions l_1, l_2:

$l_1: y=2x-1$

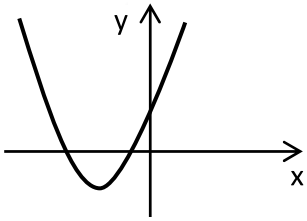
$l_2: y=-x-2$



a) $(1)\leftrightarrow l_1, (2)\leftrightarrow l_2$ c) $(1)\leftrightarrow l_1, (2)\neq l_2$

b) $(2)\leftrightarrow l_1, (1)\leftrightarrow l_2$ d) $(1)\neq l_1, (2)\leftrightarrow l_2$

23) Given the graph of the following parabola: $y = x^2 + x + c$



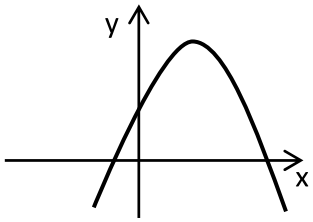
a) $c < 0$

b) $c = 0$

c) $c > 0$

d) Impossible to determine

24) Given the graph of the parabola: $y = ax^2 + bx + 1$:



a) $a > 0, b > 0$

b) $a < 0, b > 0$

c) $a < 0, b < 0$

d)$a > 0, b < 0$

25) Which number is larger $a = \sqrt{11}$ or $b = 2\sqrt{3}$?

a) $a > b$

b) $b > a$

c) $a = b$

d) not enough data

26) Given the equation $2x^2 - 3x + 4 = 0$, if the roots of the equation are $x_1 \; and \; x_2$, then:

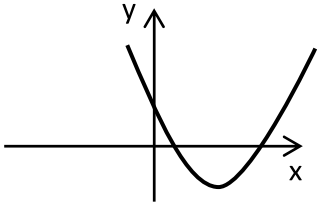
a) $x_1 x_2 = 2$

b) $x_1 x_2 = \frac{3}{2}$

c) $x_1 x_2 = 1$

d) $x_1 x_2 < 0$

27) Given the graph of the parabola $y = ax^2 + bx + 1$:



a) $b > 0$

b) $b < 0$

c) $b = 0$

d) Impossible to determine

28) If one of the roots of the equation $ax^2 + bx + c = 0$ is 0 $(x_1 = 0)$ then:

a) $c = 0$ c) $c < 0$

b) $c > 0$ d) $a > 0$

29) Given the circle $x^2 + y^2 = 9$ and point $A_1(x_1, 3)$ on the circle, then:

a) $x_1 = 0$ c) $x_1 = 8$

b) $x_1 = -3$ d)$x_1 > 0$

30) For the function $y = \sqrt{8x - x^2}$, the domain is:

a) $x > 0$ c) $-8 \leq x \leq 0$

b) $x < 0$ d) $0 \leq x \leq 8$

31) If $\frac{y}{x} = 0$, then:

a) $y = 0$ c) $x = 0\ and\ y = 0$

b) $x = 0$ d) $y = 0\ and\ x \neq 0$

32) Solve the problem and simplify the answer: $\frac{9x^2-36}{3x^2+30x+75} \cdot \frac{2x+10}{3x^2-12x+12} =$

a) $\frac{2(x+2)}{(x-2)(x+5)}$ c) $\frac{(x+2)}{(x+5)}$

b) $\frac{1}{(x-2)(x+5)}$ d) 1

33) Solve the problem and simplify the answer: $\left(2 - \frac{12}{x^2+5x+6}\right) \cdot \left(3 + \frac{63}{x^2-25}\right) =$

a) $\frac{6x(x-2)}{(x+3)(x-5)}$ c) 1

b) $\frac{(x-2)}{(x+3)}$ d) $\frac{6x}{(x-5)}$

34) The domain of the function $y = \frac{1}{\sqrt{x-x^2}}$ is:

a) $1 < x < 2$ c) $0 < x < 1$

b) $-1 < x < 0$ d) $-1 \leq x \leq 0$

35) The solution of the equation $\sin^2 x + \cos^4 x = 1$ is:

a) $x = 0$ c) $x_n = \pi n,\ n \in N$

b) $x = 1$ d) $x_n = \frac{\pi n}{2},\ n \in Z$

36) If $a = \sin^3 40^\circ + \cos^3 40^\circ$, then:

a) $a = 1$ c) $0 < a < 1$

b) $a = -1$ d) $-1 < a < 0$

37) If $x^2 + 2y = x^2 + 2y^2$, then:

a) $x = 0, y = 0$ c) $x \in R, y = \pm 1$

b) $x \in R, y = 1$ d) $x \in R, y = 1\ or\ y = 0$

38) If $(x + y)^2 = x^2 + 3xy$, then:

a) $x = y\ or\ y = 0$ c) $x = 0$

b) $x = -y\ and\ y = 0$ d) $y = 0$

39) If $a = 2\sin^2 x + \cos^2 x$, then for any x:

a) $a > 1$ c) $a < 1$

b) $a \geq 1$ d) $a \leq 1$

40) If $\log_2 x = 4, then\ \log_2\left(\sqrt{x}\right)^3 = 6$:

a) True c) Is true only if $x < 0$

b) False d) Not enough data to decide

41) If $e^x = 8$, then $e^{\frac{2}{3}x} =$

a) 4 c) $\sqrt{8}$

b) 8 d) 2

42) If $f(x) = x^2 + 1$, then the number of possible tangent lines to the function, which pass through point (0,0) is:

a) 1 c) 3

b) 2 d) 4

43) If $\log_2 5 = b \; or \log_2 3 = a, \; then \log_2 30 =$

a) 1+a+b c) 1-a+b

b) 2-a-b d) a+b-1

44) The domain of the function $f(x) = \frac{1}{4^x+2^x-20}$ is:

a) $x \neq 2, x \neq 3$ c) $x \neq 3$

b) $x \neq 2$ d) $x \neq 2, x \neq \log_2 5$

45) The solution to the equation $x^{\log_{10}(x^2)+1} = x^3$ is:

a) $x_1 = 10, x_2 = \frac{1}{10}$ c) $x_1 = \frac{1}{10}, x_2 = -\frac{1}{10}$

b) $x_1 = 10, x_2 = 100$ d) $x_1 = 10, x_2 = 1$

46) Which of the following is a simplification of the expression:

$$\frac{(2a^{-3}b^4)^3 \cdot (a^{-1}b^2)^{-4}}{(6ab^2)^2 \cdot (a^{-2}b^3)^{-1}} =$$

a) $\frac{2b^3}{9a^9}$ c) $\frac{2b}{9a^5}$

b) $\frac{b^3}{a^9}$ d) 1

47) Which of the following is a simplification of the expression:

$$\frac{(m^{-3}n^{-4}p^5)^{-2} \cdot (3mnp^{-3})^3}{(6m^{-3}np^{-4})^2 \cdot (mn^{-3}p^3)^{-3}} =$$

a) $\frac{m^{18}}{p^2}$ c) 1

b) $\frac{3m^{18}}{4p^2}$ d) $\frac{3m^{14}}{4p^5}$

48) Solve the following exponential equation: $(2^{x+1}+3)(2^{x-1}-5)=-19$

a) $x=3$ c) $x=1, x=2$

b) $x=-1$ d) $x=-1, x=3$

49) Solve the following exponential equation: $5^{x+1}-5^{-x-1}=\frac{24}{5}$

a) $x=1, x=2$ c) $x=5$

b) $x=0$ d) $x=3$

50) Solve the following exponential inequality: $4^x-2\cdot 5^{2x}-10^x>0$

a) $x<\frac{1}{1-\log_2 5}$ c) $x<\frac{1}{2}$

b) $x>\frac{1}{1-\log_2 5}$ d) $x>\frac{1}{\log_2 25}$

51) Find the range of possible values for the following function: $y=\log_5(\frac{x+2}{x-4}-2)$

a) $0<x<10$ c) $4<x<10$

b) $4\leq x\leq 25$ d) $0\leq x\leq 1$

52) Solve the following logarithmic equation: $\log_{x+1}(x^3+2x^2+3x+2)=3$

a) $x=5$ c) $x=10$

b) $x=0$ d) $x=1$

53) Solve the following logarithmic inequality: $\log_{\frac{1}{6}}(x^2-3x+2)<-1$

a) $x\in(2,4)$ c) $x\in(-\infty,-1)\cup(4,\infty)$

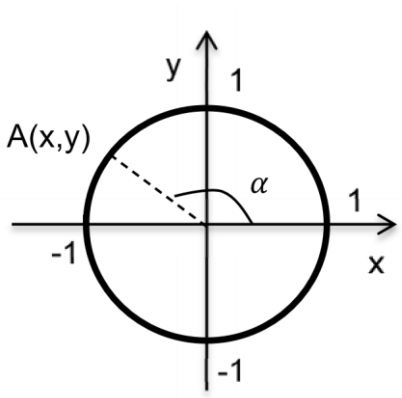
b) $x\in(-1,1)$ d) $x\in(1,2)$

54) Solve the following logarithmic inequality: $2\log_5 x-\log_x 125<1$

a) $x\in(0,0.2)$ c) $x\in(1,5^{1.5})$

b) $x\in(0,0.2)\cup(1,5^{1.5})$ d) $x\in(0,1)$

55) Given the point A (x,y) on a unit circle. Angle α, defined by this point, fulfills system:



a) $\frac{\pi}{2} < \alpha < \pi$

b) $0 \leq \alpha < \frac{\pi}{2}$

c) $\pi < \alpha \leq \frac{3\pi}{2}$

d) $2\pi > \alpha > \frac{3\pi}{2}$

56) The coordinates of point A from the previous question fulfill:

a) $x^2 + y^2 < 1$

b) $x^2 + y^2 > 1$

c) $x^2 + y^2 = 1$

d) Not enough data to decide.

57) Simplify the following trigonometric expression:

$$\left(\sqrt{\frac{1+\sin a}{1-\sin a}} - \sqrt{\frac{1-\sin a}{1+\sin a}}\right)^2$$

a) $4tan^2(a)$

b) $tan^2(a)$

c) 1

d) $4sin^2(a)$

58) Solve the following trigonometric expression: $6\sin^2 x + 5\cos x - 7 = 0$

a) $x = \pm\frac{\pi}{3} + \pi n,\ \pm\arccos\left(\frac{1}{3}\right) + \pi n,\ n \in Z$

b) $x = \pm\frac{\pi}{3} + 2\pi n,\ \pm\arccos\left(\frac{1}{3}\right) + 2\pi n,\ n \in Z$

c) $x = \frac{\pi}{2} + \pi n,\ n \in Z$

d) $x = \frac{\pi}{3} + 2\pi n,\ n \in Z$

59) Solve the following trigonometric expression: $\sin x - \sqrt{3}\cos x = 0$

a) $x = \frac{\pi}{6} + \pi n,\ n \in Z$

b) $x = \pm\arccos\left(\frac{1}{3}\right) + 2\pi n,\ n \in Z$

c) $x = \frac{\pi}{3} + 2\pi n,\ n \in Z$

d) $x = \frac{\pi}{3} + \pi n,\ n \in Z$

60) Solve the following expression: $\log_{\cos x}(\frac{1}{4}+\sin x)=2$

a) $x=\frac{\pi}{6}+2\pi n,\ \mathrm{n}\in Z$

b) $x=\frac{\pi}{3}+2\pi n,\ \mathrm{n}\in Z$

c) $x=\frac{\pi}{6}+\pi n,\ \mathrm{n}\in Z$

d) $x=\frac{\pi}{2}+\pi n,\ \mathrm{n}\in Z$