PRECALCULUS REVIEW PROBLEMS

This multiple-choice exam is based on the content of our Precalculus (MATH 1730) class, as well as the Calculus Readiness Test (Form 1E 1990) devised by the Mathematical Association of America. It is purely a diagnostic tool to help you judge your familiarity with precalculus topics - it is NOT an official testing instrument. The answers appear at the end of the exam. If you miss more than half of the problems, there is a good chance that you need to enroll in MATH 1730 before taking calculus. (However, you should seek advice from the Math Department before making decisions.)

(1) ____________ The slope of the line $3x - 4y + 8 = 0$ is

(a) $m = -4$ (b) $m = 3$

(c) $m = 3/4$ (d) $m = 4/3$

(2) ____________ The domain of the function $f(x) = \ln(2x - 1)$ is

(a) all real numbers. (b) all real numbers except $x = 0$.

(c) the set $x > 0$. (d) the set $x > 1/2$.

(3) ____________ If a rational function f is known to have a vertical asymptote at $x = a$ and a removable singularity at $x = b$, which of the following formulas could represent f?

(a) $f(x) = \dfrac{(x+a)^2(x+b)}{(x+a)^3(x+b)}$ (b) $f(x) = \dfrac{(x+a)}{(x+a)(x+b)}$

(c) $f(x) = \dfrac{(x-a)(x-b)}{(x-a)(x-b)^2}$ (d) $f(x) = \dfrac{(x-a)(x-b)^2}{(x-a)^2(x-b)}$

(4)) ____________ If $\text{Arctan}(\tan(\theta)) = \theta$, then we know that

(a) $-\pi/2 < \theta < \pi/2$ (b) $0 < \theta < \pi$

(c) $-\pi/2 < \theta < \pi$ (d) $-\pi < \theta < \pi$

(5) ____________ If $f(x) = 1 + \sin(3x - \pi/2)$, then one solution to the equation $f(x) = 3/2$ is

(a) $x = 5\pi/18$ (b) $x = 2\pi/9$

(c) $x = (60 + \pi)/6$ (d) $x = (20 + \pi)/2$

(6) ____________ The slope of the line passing through the points $(-2, 1)$ and $(4, 2)$ is

(a) $m = 1/6$ (b) $m = 2$

(c) $m = -6$ (d) $m = -2$

(7) ____________ If the radian measure for an angle θ is $-6\pi/5$, then the degree measure for θ is

(a) $150°$ (b) $-216°$

(c) $36°$ (d) $-150°$

(8) ____________ If a rational function f is known to have a horizontal asymptote at $y = 3$, which of the following formulas could represent f?

(a) $f(x) = x + 3 + \dfrac{1}{x^2+3}$ (b) $f(x) = 3 - \dfrac{x+1}{x^2+3}$

(c) $f(x) = \dfrac{3}{(x-1)(x-2)^2}$ (d) $f(x) = 3x + \dfrac{x-3}{x+3}$

(9) ____________ Suppose A is in degree measure. We know that $\sin(A + 720°)$ is equal to

(a) $\sin(A)$

(b) $\cos(A)$

(c) $-\sin(A)$

(d) $-\cos(A)$

(10) ____________ The domain of the function $f(x) = e^{2x-1}$ is

(a) all real numbers.

(b) all real numbers except $x = 0$.

(c) the set $x > 0$.

(d) the set $x > 1/2$.

(11) ____________ Let $a > 0$. If we know that $b = a^c$, then we also know

(a) $b = \log_c(a)$

(b) $a = \ln(b)$

(c) $c = \log_a(b)$

(d) $b = \ln(a)$

(12) ____________ The slope of any line perpendicular to the line $y = -5x + 8$ will be

(a) $m = 1/5$

(b) $m = 5$

(c) $m = -5$

(d) $m = -1/5$

(13) ____________ If a parabola is known to have a minimum at the point $(-3, 5)$, which of the following formulas could represent the parabola?

(a) $f(x) = (x - 3)^2 + 5$

(b) $f(x) = (x - 5)^2 + 3$

(c) $f(x) = -2(x + 3)^2 + 5$

(d) $f(x) = 5(x + 3)^2 + 5$

(14) ____________ Suppose A is in radian measure. We know that $\cos(\pi/2 - A)$ is equal to

(a) $\cos(A)$

(b) $\sin(A)$

(c) $-\sin(A)$

(d) $-\cos(A)$

(15) ____________ An algebraic formula for $y = \cot(\text{Arcsin}(3x/2))$ would be

(a) $y = \dfrac{2}{3x}$

(b) $y = \dfrac{3x}{2}$

(c) $y = \dfrac{\sqrt{4 - 9x^2}}{3x}$

(d) $y = \dfrac{2}{2 - 3x}$

(16) ____________ Suppose A is in degree measure. We know that $\sin(A - 90°)$ is equal to

(a) $\cos(A)$

(b) $\sin(A)$

(c) $-\sin(A)$

(d) $-\cos(A)$

(17) ____________ If the point $(3, 4)$ lies on the graph of an invertible function f, then which of the following points lies on the graph of its inverse?

(a) the point $(4, 3)$

(b) the point $(3, -4)$

(c) the point $(3, 1/4)$

(d) the point $(-3, 4)$

(18) ____________ The line parallel to $y = 5x + 8$ having y-intercept $(0, 4)$ has the formula

(a) $y = -(1/5)x - 4$

(b) $y = (1/5)x + 4$

(c) $y = 5x + 4$

(d) $y = -5x + 12$

(19) ______________ If a is a real number, then we know that $a^{4/5}$ is equal to

(a) $\sqrt[5]{a^4}$ (b) $\sqrt[4]{a^5}$

(c) $(\sqrt[4]{a})^5$ (d) $\left(\frac{1}{a^5}\right)^4$

(20) ______________ If we know that $\sec(\theta) = -5/4$, then we also know that

(a) $\cos(\theta) = -4/5$ (b) $\sin(\theta) = -4/5$

(c) $\tan(\theta) = 5/4$ (d) $\cot(\theta) = 5/4$

(21) ______________ Let f be a function defined at $x = a$ and $x = b$. The average rate of change for f between $x = a$ and $x = b$ is

(a) $\dfrac{f(a) - f(b)}{b - a}$ (b) $\dfrac{f(b) - f(a)}{b - a}$

(c) $\dfrac{f(a + b) - f(b)}{a - b}$ (d) $\dfrac{f(b) - f(b - a)}{a}$

(22) ______________ The inverse of the function $f(x) = 7x + 8$ will be

(a) $g(x) = (x - 8)/7$ (b) $g(x) = 1/(7x + 8)$

(c) $g(x) = 8/(x - 7)$ (d) $g(x) = -7x - 8$

(23) ______________ If $\sin(A) < 0$ and $\tan(A) < 0$, then

(a) $\cos(A) = -\sqrt{1 - \sin^2(A)}$ (b) $\cos(A) = \sqrt{1 - \sin^2(A)}$

(c) $\cos(A) = \sqrt{\sin^2(A) - 1}$ (d) $\cos(A) = -\sqrt{\sin^2(A) - 1}$

Problems 24-26 refer to the following function.

$$f(x) = \begin{cases} 3 & \text{if } x < 2 \\ x - 1 & \text{if } 2 < x \leq 4 \\ 2x - 5 & \text{if } 4 < x \end{cases}$$

(24) ______________ The value of $f(0)$ is

(a) undefined (b) 3

(c) 0 (d) -1

(25) ______________ The value of $f(2)$ is

(a) undefined (b) 3

(c) 1 (d) -1

(26) ______________ The formula $x - 1$ is valid on the interval

(a) $[2, 4)$ (b) $[2, 4]$

(c) $(2, 4)$ (d) $(2, 4]$

(27) ______________ If a function f is symmetric with respect to the y-axis and (a, b) lies on the graph of f, then

(a) $(a, -b)$ lies on the graph of f. (b) $(-b, a)$ lies on the graph of f.

(c) $(-a, -b)$ lies on the graph of f. (d) $(-a, b)$ lies on the graph of f.

(28) ______________ If $f(x) = \sqrt{x}$ and $g(x) = x^2$, then $(gf)(x)$ is equal to

(a) $\sqrt{x}/x$

(b) $|x|$

(c) $x^2\sqrt{x}$

(d) x

(29) ______________ A street lamp rises vertically from a level sidewalk. When a five-foot woman stands eight feet from the base of the lamp, she casts a ten foot shadow. The depression angle between the light and the tip of her shadow is

(a) exactly $30°$.

(b) approximately $26.6°$.

(c) approximately $63.4°$

(d) exactly $43°$.

Problems 30-33 refer to the function $f(x) = 2 + \cos\left[3x - \frac{\pi}{2}\right]$.

(30) ______________ The period of the function f is

(a) 2π

(b) 3

(c) $2\pi/3$

(d) 2

(31) ______________ Compared to the basic cosine function, the horizontal translation of f is

(a) $\pi/2$ units right.

(b) $\pi/6$ units right.

(c) 2 units left.

(d) 3 units left.

(32) ______________ The amplitude of the function f is

(a) π.

(b) 3.

(c) 2.

(d) 1.

(33) ______________ In an interval of width 2π, the function f will complete

(a) three oscillations.

(b) two oscillations.

(c) one oscillation.

(d) π oscillations.

(34) ______________ If $f(x) = x^2 - 3$, then $(f \circ f)(2)$ is equal to

(a) 1

(b) -2

(c) $2(x^2 - 3)^2$

(d) $2(x^2 - 3)^2 - 6$

(35) ______________ The maximum value of $f(x) = -3 + 4\cos(2x + \pi)$ is

(a) -3.

(b) 2.

(c) 1.

(d) 4.

(36) ______________ A radio tower rises vertically from a stretch of level ground. A support cable strung taut from the top of the tower makes a $40°$ angle with the ground. If the cable is three hundred feet long, approximately how tall is the tower?

(a) 171 feet

(b) 252 feet

(c) 230 feet

(d) 193 feet

(37) ______________ The reference angle for $\theta = 330°$ is

(a) $A = -60°$

(b) $A = 150°$

(c) $A = 60°$

(d) $A = 30°$

(38) ______________ The laws of logarithms tells us that $\log(x-1) - \log(x-2)$ is equal to

(a) $\dfrac{x-1}{x-2}$

(b) $\dfrac{\log(x-1)}{\log(x-2)}$

(c) $\log\left[\dfrac{x-1}{x-2}\right]$

(d) $-\log[(x-1)(x-2)]$

(39) ______________ A tire of radius three feet rolls along the ground at an angular speed of 4 radians per second. In six seconds, the tire will roll

(a) 72 feet

(b) 12 feet

(c) 36π feet

(d) 24π feet

(40) ______________ If the point $(3, 2)$ lies on the graph of $f(x) = \log_a(x)$, then we know

(a) $a^2 = 3$

(b) $a^3 = 2$

(c) $3^a = 2$

(d) $a = 3/2$

(41) ______________ Let θ be an angle in standard position and suppose (a, b) is a point on the terminal side of θ a positive distance r from the origin. We know that

(a) $\cot(\theta) = y/x$

(b) $\sec(\theta) = x/r$

(c) $\tan(\theta) = x/y$

(d) $\csc(\theta) = r/y$

(42) ______________ A tire rolls 4π feet when it is rotated through an angle of $240°$. The radius of the tire is

(a) $\pi/5$ feet

(b) $4/\pi$ feet

(c) 3 feet

(d) 4 feet

(43) ______________ If we know θ lies in Quadrant IV, then which of the following statements is correct?

(a) $\sin(\theta) = \sqrt{1-\cos^2(\theta)}$

(b) $\sin(\theta) = -\sqrt{1-\cos^2(\theta)}$

(c) $\cos(\theta) = 1 - \sin(\theta)$

(d) $\cos^2(\theta) = \sin^2(\theta) - 1$

(44) ______________ We know that $\log_4(10)$ is approximately

(a) 0.602

(b) 1.661

(c) 2.303

(d) 1.386

(45) ______________ If we know θ lies in Quadrant II and $\cos(\theta) = -3/5$, then we also know that $\sin(\theta)$ is equal to

(a) $4/5$

(b) $-4/5$

(c) $1/3$

(d) $3/5$

(46) ______________ The equation $\log(2x-5) = 8$ is equivalent to

(a) $2x - 5 = e^8$

(b) $2x - 5 = 8$

(c) $e^{2x-5} = e^8$

(d) $2x - 5 = 10^8$

(47) ______________ We have $\ln[(1-2x)^2] = 2\ln(1-2x)$

(a) for $x < 1/2$.

(b) for all x.

(c) for $x \neq 1/2$.

(d) for $x > 0$.

(48) ______________ If $f(x) = x^2 - 1$, then the formula which gives the average rate of change for f on the interval $a \leq x \leq a + h$ is

(a) $y = a$

(b) $y = \dfrac{a^2 - 1}{h}$

(c) $y = 2a + h$

(d) $y = \dfrac{2h - a^2}{a}$

(49) ______________ If we write $y = \ln(x\sqrt{x^2 - 1})$ as a sum of natural logs, we obtain

(a) $\ln(x) + \ln(x) - \ln(1)$

(b) $\ln(x) + (1/2)\ln(x - 1)$

(c) $\ln(x) + (1/2)\ln(x + 1) + (1/2)\ln(x - 1)$

(d) $(1/2)\ln(x) + \ln(x) + (1/2)\ln(-1)$.

(50) ______________ If $f(x) = 5 + 3\cos[4(x - 1)]$ and a is any real number, then which of the following must equal $f(a)$?

(a) $f(a + 3\pi/2)$

(b) $f(a + \pi/4)$

(c) $f(a + 8)$

(d) $f(a - 4)$

(51) ______________ The terminal side of $\theta = 23\pi/3$ lies in

(a) Quadrant I

(b) Quadrant II

(c) Quadrant III

(d) Quadrant IV

(52) ______________ The method for solving $\log_2(x) + \log_2(x + 1) = 1$ yields two possible solutions, namely $x = 1$ and $x = -2$. From this, we know

(a) both $x = 1$ and $x = -2$ are solutions.

(b) only $x = 1$ is a solution.

(c) only $x = -2$ is a solution.

(d) neither $x = 1$ nor $x = -2$ is a solution.

(53) ______________ The function $f(x) = \dfrac{5x^2 - 3x + 1}{x - 3}$ has slant asymptote

(a) $y = 5x$

(b) $y = -3x$

(c) $y = 3$

(d) $y = 5x + 12$

(54) ______________ Suppose an ant is sitting on the perimeter of the unit circle at the point (0,-1). If the ant travels a distance of $2\pi/3$ units in the clockwise direction, then the coordinates of the point where the ant stops will be

(a) $(\sqrt{3}/2, 1/2)$

(b) $(-1/2, \sqrt{3}/2)$

(c) $(1/2, \sqrt{3}/2)$

(d) $(-\sqrt{3}/2, 1/2)$

(55) ______________ The function $y = \dfrac{x^2 - 1}{x^2 - x - 2}$ has a vertical asymptote

(a) at $x = -1$ and $x = 2$.

(b) only at $x = 2$.

(c) only at $x = 1$.

(d) only at $x = -1$.

(56) ______________ The average rate of change for $f(x) = 1 + \sqrt{x}$ on the interval $[1, 4]$ is

(a) 1/3.

(b) 1/2.

(c) 0.

(d) 2/3.

(57) ______________ Suppose you deposit $\$1,000$ into an account which pays 4% annual interest, compounded quarterly. Approximately how long will it take for the amount of money in the account to double?

(a) About 25 years
(b) About 17.4 years
(c) About 17.3 years
(d) About 25.2 years

(58) ______________ If we were to graph the function $y = 3x2 - 1$ on the interval $-1 < x \leq 2$, then we would

(a) place an open circle at $(-1, 2)$ and at $(2, 11)$
(b) place a closed circle at $(-1, 2)$ and at $(2, 11)$
(c) place a closed circle at $(-1, 2)$ and an open circle at $(2, 11)$
(d) place an open circle at $(-1, 2)$ and a closed circle at $(2, 11)$

(59) ______________ The vertex of the parabola $y = 2x^2 - 8x + 9$ is the point

(a) $(2, 1)$
(b) $(-1, -2)$
(c) $(1/2, -1)$
(d) $(1, 2)$

(60) ______________ If $f(x) = 5x + 4$, then the inverse of f will

(a) subtract 4 from its input, then divide by 5.
(b) divide its input by 5, then subtract 4.
(c) divide its input by 4, then subtract 5.
(d) subtract 5 from its input, then divide by 4.

Answers

(1) C	(2) D	(3) D	(4) A
(5) B	(6) A	(7) B	(8) B
(9) A	(10) A	(11) C	(12) A
(13) D	(14) B	(15) C	(16) D
(17) A	(18) C	(19) A	(20) A
(21) B	(22) A	(23) B	(24) B
(25) A	(26) D	(27) D	(28) C
(29) B	(30) C	(31) B	(32) D
(33) A	(34) B	(35) C	(36) D
(37) D	(38) C	(39) A	(40) A
(41) D	(42) C	(43) B	(44) B
(45) A	(46) D	(47) A	(48) C
(49) C	(50) A	(51) D	(52) B
(53) D	(54) D	(55) B	(56) A
(57) B	(58) D	(59) A	(60) A