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Pre-Calculus C: Exam Review

All problems are to be done without the use of a calculator unless denoted with an *.
You may show you work in this packet OR on graph/lined paper.

1.

Convert the point whose polar coordinates are $\left(1/\sqrt{2}, 3\pi/4\right)$ to rectangular coordinates.

(a) $\left(\frac{3}{2}, \frac{\sqrt{3}}{2}\right)$ (b) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (c) $\left(-\sqrt{2}, \sqrt{2}\right)$ (d) $\left(\sqrt{3}, \sqrt{2}\right)$ (e) $(-1, 1)$

2.

Which of the following is ***not*** a polar point representation for the point $(3, \pi/3)$?

(a) $(3, 7\pi/3)$ (b) $(-3, 4\pi/3)$ (c) $(3, 2\pi/3)$ (d) $(-3, 10\pi/3)$ (e) $(3, 13\pi/3)$

3.

Convert the rectangular coordinates to polar coordinates with $r > 0$ and $0 \le \theta < 2\pi$.

$\left(-2\sqrt{3}, -2\right)$

(a) $(4, \pi/6)$ (b) $(4, 5\pi/3)$ (c) $(2, 11\pi/6)$ (d) $(4, 7\pi/6)$ (e) none of these

4.

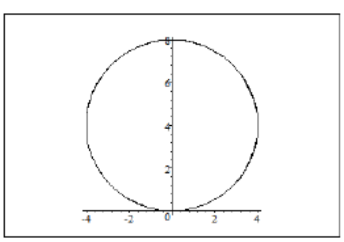
Convert the rectangular coordinates to polar coordinates with $r > 0$ and $0 \le \theta < 2\pi$.

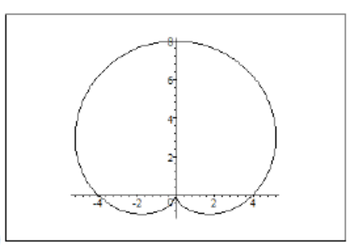
$\left(0, -\sqrt{2}\right)$

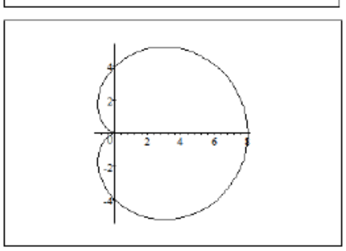
(a) $(4, \pi/2)$ (b) $\left(\sqrt{2}, 3\pi/2\right)$ (c) $(4, 3\pi/2)$ (d) $\left(\sqrt{2}, \pi\right)$ (e) $(4, \pi)$

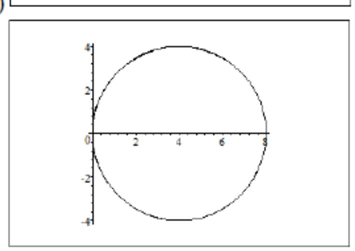
5.

Graph the polar equation $r = 8\cos\theta$.


(a)


(b)


(c)


(d)

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Pre-Calculus C: Exam Review

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6.

Convert the equation to polar form.

$x^2 + y^2 = 4$

(a) $r^2 = 4$ (b) $4r = \cos\theta + \sin\theta$ (c) $r = 4\cos\theta + 4\sin\theta$ (d) $r = 4$ (e) none of these

7.

Convert the polar equation to rectangular coordinates.

$\frac{r}{3} = \csc\theta$

(a) $y = 3$ (b) $x = 3$ (c) $xy = 3$ (d) $y = 3x + 1$ (e) none

8.

Find the first four terms sequence $a_n = n - 1$.

(a) $a_1 = -1$, $a_2 = 0$, $a_3 = 1$, $a_4 = 2$
(b) $a_1 = 0$, $a_2 = 1$, $a_3 = 2$, $a_4 = 3$
(c) $a_1 = -2$, $a_2 = -3$, $a_3 = -4$, $a_4 = -5$
(d) $a_1 = 1$, $a_2 = 2$, $a_3 = 3$, $a_4 = 4$
(e) none of these

9.

Find the 1000^{th} term of the sequence $a_n = (-1)^n \frac{n+2}{n}$.

(a) $a_{1000} = -\frac{501}{500}$ (b) $a_{1000} = \frac{251}{250}$ (c) $a_{1000} = \frac{126}{125}$ (d) $a_{1000} = -\frac{126}{125}$ (e) $a_{1000} = \frac{501}{500}$

10.

Find the first five terms of the sequence $a_n = 3a_{n-1} - 1$, where $a_1 = 3$.

(a) $a_1 = 1$, $a_2 = 6$, $a_3 = 21$, $a_4 = 66$, $a_5 = 201$
(b) $a_1 = 3$, $a_2 = 9$, $a_3 = 27$, $a_4 = 69$, $a_5 = 226$
(c) $a_1 = 3$, $a_2 = 8$, $a_3 = 23$, $a_4 = 68$, $a_5 = 203$
(d) $a_1 = 1$, $a_2 = 7$, $a_3 = 22$, $a_4 = 67$, $a_5 = 202$
(e) none of these

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Pre-Calculus C: Exam Review

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11.

Find the n^{th} term of the sequence whose first several terms are $\frac{1}{4}, -\frac{1}{9}, \frac{1}{16}, -\frac{1}{25}, \ldots$

(a) $a_n = \frac{(-1)^{n+1}}{n^2}$ (b) $a_n = \frac{(-1)^{n+1}}{(n+1)^2}$ (c) $a_n = \frac{(n+1)^n}{4^2}$ (d) $a_n = \frac{(1)^n}{(2n)^2}$ (e) none of these

12.

The first four terms of a sequence are given. Determine whether they can be terms of an arithmetic sequence, a geometric sequence, or neither. If the sequence is arithmetic find the common difference. If the sequence is geometric find the common ratio.

$-s, -2s, -3s, -4s, \ldots$

(a) arithmetic, $d = -s$

(b) arithmetic, $d = -\frac{1}{2}$

(c) geometric, $r = \frac{3s}{2}$

(d) geometric, $r = -\frac{s}{4}$

(e) neither

13.

Given that the 5^{th} term of an arithmetic sequence is 30 and the 7^{th} term is 44, find the first term.

(a) $a_1 = 7$

(b) $a_1 = 4$

(c) $a_1 = -4$

(d) $a_1 = -2$

(e) $a_1 = 2$

14.

The first term of the arithmetic sequence is $\frac{2}{3}$ and the common difference is $\left(-\frac{2}{3}\right)$. Which term of this sequence is $-\frac{20}{3}$?

(a) 10^{th} term (b) 12^{th} term (c) 13^{th} term (d) 16^{th} term (e) 6^{th} term

15.

The common ratio of a geometric sequence is $\frac{3}{7}$ and the fourth term is $\frac{1}{7}$. Find the third term.

(a) $a_3 = \frac{1}{3}$ (b) $a_3 = \frac{7}{3}$ (c) $a_3 = \frac{3}{7}$ (d) $a_3 = \frac{5}{3}$ (e) $a_3 = \frac{2}{7}$

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16.

Find the fourth term of the geometric sequence given $a_1 = 7$ and $r = \frac{1}{7}$.

(a) $a_4 = \frac{1}{7}$ (b) $a_4 = -\frac{1}{49}$ (c) $a_4 = \frac{1}{14}$ (d) $a_4 = \frac{1}{49}$ (e) $a_4 = 49$

17.

Find the values of a and b for which the sequence $2, a, b, 17, \ldots$ is arithmetic.

(a) $a = 7, b = 12$ (b) $a = 6, b = 12$ (c) $a = 8, b = 12$ (d) $a = 10, b = 12$ (e) $a = 8, b = 15$

18*.

A man gets a job with a salary of $50,000 a year. He is promised an $1800 raise each subsequent year. Find his total earnings for a 10-year period.

(a) $518,000
(b) $851,000
(c) $1,581,000
(d) $481,000
(e) none of these

19.

Write the sum without using sigma notation.

$$\sum_{n=2}^{100} \frac{1}{n-1}$$

(a) $1+2+\frac{1}{3}+\frac{1}{4}+\ldots+\frac{1}{99}+\frac{1}{100}$
(b) $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots+\frac{1}{98}+\frac{1}{99}$
(c) $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots+\frac{1}{99}+\frac{1}{100}$
(d) $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots+\frac{1}{97}+\frac{1}{98}$
(e) none of these

20.

Write the sum using sigma notation.

$$\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+\ldots+\frac{1}{999\cdot 1000}$$

(a) $\sum_{n=1}^{1000} \frac{1}{n(n+1)}$ (b) $\sum_{n=1}^{1000} \frac{1}{n(n-1)}$ (c) $\sum_{n=1}^{999} \frac{1}{n(n+1)}$ (d) $\sum_{n=1}^{1001} \frac{1}{n(n+1)}$ (e) $\sum_{n=1}^{999} \frac{1}{n(n-1)}$

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21.

Find the sum.

$2+4+6+8+\cdots+100$

(a) 2000 (b) 200 (c) 2050 (d) 1550 (e) none of these

22*.

Determine whether the expression is a partial sum of an arithmetic or geometric sequence. Then find the sum.

$5+25+125+\ldots+3125$

(a) 19530 (b) 7810 (c) 3125 (d) 3280 (e) 3905

23*.

The seventh term of an arithmetic sequence is -16 and the tenth term is -31. Find the twenty-fourth term.

(a) $a_{24}=-101$ (b) $a_{24}=-66$ (c) $a_{24}=-55$ (d) $a_{24}=-201$ (e) $a_{24}=-51$

24.

Find the sum of the infinite geometric series.

$a+ax^2+ax^4+ax^6+\ldots$

(a) $S=\frac{x}{1-a^2}$ (b) $S=\frac{a}{1-x^4}$ (c) $S=\frac{x^2}{1-a^2}$ (d) $S=\frac{1}{1+x^2}$ (e) $S=\frac{a}{1-x^2}$

25.

A ball rebounds to one-quarter the height from which it was dropped. Approximate the total vertical distance the ball travels after being dropped from 3 ft above the ground, until it comes to rest.

(a) 5 ft (b) 5.25 ft (c) 4.125 ft (d) 3.5 ft (e) 3.25 ft

26.

Find the second term in the expansion of $\left(x^2-\frac{1}{x}\right)^{50}$.

(a) $50x^{97}$ (b) $-47x^{47}$ (c) $-50x^{48}$ (d) $50x^{49}$ (e) $-50x^{97}$

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Pre-Calculus C: Exam Review

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27.

Expand the expression.

$(1-xy)^4$

(a) $4-xy+6x^2y^2-4x^3y^3+x^4y^4$
(b) $1-xy+6x^2y^2-4x^3y^3+4x^4y^4$
(c) $1-4xy+4x^2y^2-6x^3y^3+x^4y^4$
(d) $4-4xy+x^2y^2-x^3y^3+4x^4y^4$
(e) $1-4xy+6x^2y^2-4x^3y^3+x^4y^4$

28.

Find the coefficient of a^4b^4 in the expansion of $(b-a)^8$.

(a) -28 (b) 28 (c) -56 (d) 56 (e) 70

29*.

Complete the table of values (to five decimal places) and use the table to estimate the value of the limit.

$$\lim_{x\to 1}\frac{x^2-1}{x^3+x^2-2x}$$

x	0.9	0.99	0.999	1.001	1.01	1.1
$f(x)$						

(a) 0.725 (b) 0.65 (c) 1.34 (d) 1.67 (e) none of these

30*.

Complete the table of values to estimate the value of the limit.

$$\lim_{x\to 0^+}\frac{1-\cos x}{x^2}$$

x	2	1	0.5	0.1	0.05
$f(x)$					

(a) 2.005 (b) 2.105 (c) 0.05 (d) 0.5 (e) .4895

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Pre-Calculus C: Exam Review

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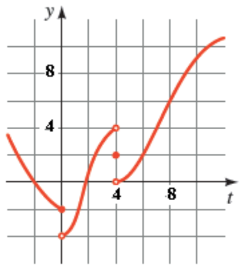
31.

For the function g whose graph is given, state the value of the given quantity if it exists.

$\lim_{x\to 4} g(t)$



(a) $\lim_{x\to 4} g(t) = -4$ (b) $\lim_{x\to 4} g(t) = 0$ (c) $\lim_{x\to 4} g(t) = 4$ (d) $\lim_{x\to 4} g(t) = 2$ (e) does not exist

32.

Let $f(x)=\begin{cases} 3 & \text{if } x<0 \\ 2x-3 & \text{if } x\ge 0 \end{cases}$. Find $\lim_{x\to 0^+} f(x)$.

(a) $\lim_{x\to 0^+} f(x)=\infty$

(b) $\lim_{x\to 0^+} f(x)=0$

(c) $\lim_{x\to 0^+} f(x)=1.5$

(d) $\lim_{x\to 0^+} f(x)=3$

(e) $\lim_{x\to 0^+} f(x)=-3$

33.

Graph the piecewise function. Use your graph to find $\lim_{x\to 1} f(x)$.

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

(a) $\lim_{x\to 1} f(x)=1$

(b) $\lim_{x\to 1} f(x)=2$

(c) $\lim_{x\to 1} f(x)=5$

(d) $\lim_{x\to 1} f(x)=\infty$

(e) does not exist

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Pre-Calculus C: Exam Review

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34.

Use the Limit Laws to evaluate the limit, if it exists.

$$\lim_{x\to 1}\left(x^3+x^2+x+1\right)$$

(a) 2 (b) 4 (c) 3 (d) 1 (e) 0

35.

Use the Limit Laws to evaluate the limit, if it exists.

$$\lim_{x\to -3}\frac{x^2-9}{x^2+2x-3}$$

(a) 0 (b) -3 (c) $\frac{3}{2}$ (d) ∞ (e) does not exist

36.

Evaluate the limit if it exists.

$$\lim_{t\to 0}\left(\frac{1}{3t}-\frac{1}{t^2+3t}\right)$$

(a) $1/3$ (b) $-1/3$ (c) 0 (d) $1/9$ (e) does not exist

37*.

Evaluate the limit, if it exists.

$$\lim_{x\to 1}\frac{|1-x|}{1-x}$$

(a) -1 (b) 1 (c) 0 (d) ∞ (e) does not exist

38.

Evaluate the limit, if it exists.

$$\lim_{x\to\infty}\frac{x^3+1}{x^5-3x^2+6}$$

(a) 6 (b) $1/6$ (c) 0 (d) ∞ (e) does not exist

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Pre-Calculus C: Exam Review

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39.

Find the slope of the tangent line to the graph of f at the point $(0,3)$.

$f(x) = 3 - 4x$

(a) -4 (b) -3 (c) 3 (d) 1 (e) -1

40.

Find the slope of the tangent line to the graph of f at the point $(2,-9)$.

$f(x) = 1 + x - 3x^2$

(a) -11 (b) 12 (c) -6 (d) -9 (e) -1

41.

Find the derivative of the function at the given number.

$g(x) = x^2 + x^3$ at 1

(a) 4 (b) -4 (c) 5 (d) -5 (e) -2

42.

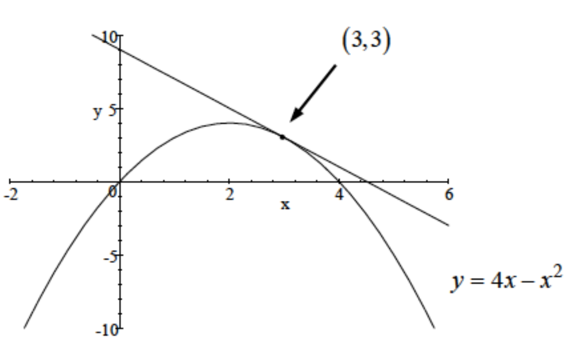
Find $f'(a)$.

$f(x) = \sqrt{x+7}$

(a) $-\frac{1}{\sqrt{a+7}}$ (b) $\frac{\sqrt{a-7}}{2}$ (c) $\frac{1}{2\sqrt{a+7}}$ (d) $-\frac{1}{2\sqrt{a+7}}$ (e) none of these

43.

Find the equation of the tangent line shown in the figure.



(a) $y = 9 - 2x$ (b) $y = 2x + 6$ (c) $y = 6 - 9x$ (d) $y = 3 - 9x$ (e) $y = 2x - 6$

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44.

Find the equation of the line tangent to the graph of $f(x)=\frac{x^3}{2}$ at the point $\left(1,\frac{1}{2}\right)$.

(a) $y=\frac{3}{2}x-1$ (b) $y=3x-1$ (c) $y=3x-2$ (d) $y=\frac{3}{2}x+2$ (e) $y=2x+3$

45.

A rocket is fired directly upward from the ground with a velocity of 128 ft/s. Its height H after t seconds is given by $H(t)=128t-16t^2$. Find the velocity of the rocket when $t=a$ seconds.

(a) 256 ft/s (b) $128a$ ft/s (c) $128-32a$ ft/s (d) $32a$ ft/s (e) $128-16a$ ft/s

46.

An object is dropped from a height of 550 ft. Its distance above the ground after t seconds is given by $h(t)=550-16t^2$. Find the object's instantaneous velocity after 1.5 s.

(a) 48.0 ft/s (b) –32.0 ft/s (c) –48.0 ft/s (d) 32.0 ft/s (e) –16.0 ft/s

47.

Determine whether the sequence $a_n=\frac{n^3}{n^3+5}$ converges or diverges. If it converges, find the limit.

(a) converges, 1 (b) converges, -1 (c) converges, 5 (d) converges, 0 (e) diverges

48.

Determine whether the sequence $a_n=\left(\frac{4}{3}\right)^n$ converges or diverges. If it converges, find the limit.

(a) converges, $-4/3$ (b) converges, 4 (c) converges, -3 (d) converges, 1 (e) diverges

49*.

The downward velocity of a falling raindrop at time t is modeled by the function $v(t)=2.3\left(1-e^{-6.3t}\right)$.
Find the terminal velocity of the raindrop by evaluating $\lim_{t\to\infty} v(t)$

(a) 6.3 (b) –6.3 (c) 2.3 (d) –3.2 (e) 1

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50.

Estimate the area under the graph of $f(x) = x^2 - 1$ from $x = 1$ to $x = 5$ using four approximating rectangles and *left* endpoints.

(a) 24 (b) $\frac{8}{3}$ (c) $\frac{23}{24}$ (d) 26 (e) 13

51.

Estimate the area under the graph of $f(x) = 2^{-x}$ from $x = 0$ to $x = 4$ using four approximating rectangles and *right* endpoints.

(a) $\frac{15}{16}$ (b) 1 (c) $\frac{13}{16}$ (d) $\frac{7}{8}$ (e) $\frac{13}{14}$