Pre-Calculus Final Exam Review: CH6 Vectors & Polar Graphs; CH3 Exponential & Logarithmic Functions; CH9(and Sec.1.9) Conics; CH10 Sequences & Series; and CH2 Rational Functions

It is suggested to go back to each chapter and redo the review worksheets provided for those assessments, as well as, complete the following:

1) Find the domain of $f(x) = \frac{2x-5}{x+4}$ in interval notation.

2) Find the domain of $f(x) = \frac{3x}{x^2-5x-14}$ in interval notation.

3) Find the zeros of $f(x) = \frac{2x-9}{x^3+2x^2-8x}$

4) Find the zeros of $f(x) = \frac{x^3-x^2-6x}{-3x^2-3x+18}$

5) Find the horizontal asymptote, if there is one, of each:

a) $f(x) = \frac{15x}{3x^2+1}$ b) $f(x) = \frac{15x^2}{3x^2+1}$ c) $f(x) = \frac{15x^3}{3x^2+1}$

6) Convert each to polar coordinates (in radians):

a) $(5\sqrt{2}, -5\sqrt{2})$ b) $(-7, -7)$ c) $(0, -3)$ d) $(-3\sqrt{3}, -3)$

7) Convert each to rectangular coordinates in exact form:

a) $(3, \frac{\pi}{2})$ b) $(2, \frac{7\pi}{4})$ c) $\left(4, \frac{5\pi}{6}\right)$

8) Graph each of the following polar equations (include enough points for an accurate graph):

a) $r = 2 + 4cos\theta$ b) $r = 2cos4\theta$ c) $r = 3sin3\theta$ d) $r = 2 + 2sin\theta$

9) A force of 20 N is pulling an object east and another force of 10 N is pulling the object in the compass direction of 150 degrees. Find the magnitude of the resultant force.

10) If a 120 lb box sits on a ramp that makes a 40 degree angle with the horizontal, find:

a) The component of the 120 lb force that is parallel to the ramp.
b) The component of the 120 lb force that is perpendicular to the ramp.

11) Determine the angle between vector $\vec{u} = \langle 2, 4 \rangle$ and vector $\vec{v} = \langle 5, 3 \rangle$. Round to the nearest 10^{th} of a degree.

12) Find the vector that has initial point P (-1, 6) and terminal point Q (7, -5).

13) Find the magnitude of vector $\vec{u} = \langle -1, 4 \rangle$

14) Use the dot product to determine whether $\vec{v} = \langle 12, -8 \rangle$ and $\vec{u} = \langle 2, 3 \rangle$ are orthogonal.

15) A heavy crate is dragged 50 feet along a level floor. Find the work done if a force of 30 lbs at an angle of 42 degrees is used. Round to the hundredths.

16) Solve each. Round to four decimal places, if needed.

a) $10^{2x} = 55$ b) $5^{2x-1} = 55$ c) $4e^{2x} = 6$

17) Evaluate each:

a) $log_{\sqrt{2}} 1$ b) $log_2(-1)$ c) $log_2 \frac{1}{8}$

18) Simplify each to a single log:

a) $3log_b x - 2log_b y + \frac{1}{2} log_b z$ b) $\frac{1}{2} log_b x + 3log_b y - 2log_b z$

19) Simplify:

a) lne^{4x} b) lne^{3ab}

20) Solve each:

a) $9^x = \left(\frac{1}{27}\right)^{x+5}$ b) $5^{2x} = 125^{x-1}$

21) Solve for x:

a) $log_5|x| = 2$ b) $log_x \frac{1}{49} = 2$ c) $log_3 \frac{1}{81} = x$

22) Simplify each:

a) e^{lnx^2} b) e^{5lnx} c) e^{3+lnx}

23) Simplify each:

a) $ln\ 3e^7$ b) $ln\ 2e^3$

24) Solve for x:

a) $\frac{log_7(x+1)}{2} = 1$ b) $2log_5(x+1) - log_5 x = 1$

25) Find the principal needed to give you $500,000 in 20 years with a rate of 12% compounded monthly.

26) Evaluate each to 4 decimal places:

a) $log_3 7$ b) $log_5 3.8$

27) a) How many terms are in the arithmetic sequence: 178, 170, ……. 2?
b) How many terms are there that are multiples of 6 between 1 and 1000.

28) State whether the given sequence is arithmetic, geometric, or neither. If arithmetic, give the common difference, if geometric give the common ratio.
a) 17, 21, 25, 29, … b) 8, 12, 18, 27, … c) 1, 4, 9, 16, …

29) Determine the sum of all the multiples of 5 between 1 and 497.

30) Find the sum of the series in terms of x:
$\frac{x^2}{3} - \frac{x^4}{6} + \frac{x^6}{12} - \ldots$

31) What is the sixth term of the sequence defined by: $t_1 = 4;\ t_2 = 16\ and\ t_n = t_{n-1} + t_{n-2}$

32) Find the vertex and focus of the parabola: $(y-2)^2 + 16(x-3) = 0$

33) Find the vertex and focus of the parabola: $x^2 + 8y = 0$

34) Find the vertex and directrix of the parabola: $x^2 + 2x - 4y + 17 = 0$

35) Give the standard form of the equation of the parabola with the given characteristics:

Vertex: $(-3, 1)$ focus: $(-1, 1)$

36) Find the center and foci of the ellipse: $\frac{(x+5)^2}{5} + \frac{(y+9)^2}{9} = 1$

37) Find the standard form of the equation of the ellipse with vertices $(0, \pm 5)$ and eccentricity $e = \frac{4}{5}$

38) Find the center and vertices of the hyperbola: $11x^2 - 25y^2 + 22x + 250y - 889 = 0$

39) Find the center and vertices of the ellipse: $x^2 + 9y^2 + 16x - 54y + 136 = 0$

40) Find the standard form of the equation of the hyperbola with the given characteristics:

Vertices: $(0, -1), (10, -1)$ asymptotes: $y = \frac{3}{5}x - 4, y = -\frac{3}{5}x + 2$

- You should also be able to graph any of the above conics.

Answers:

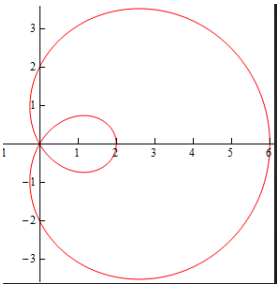
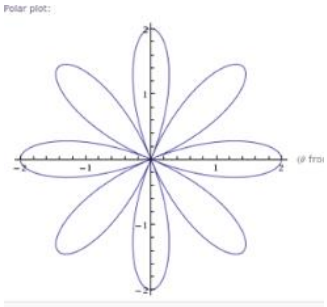
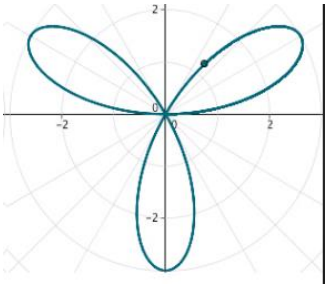
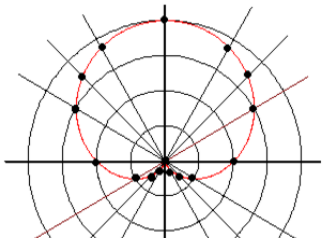
1) $(-\infty, -4) \cup (-4, \infty)$ 2) $(-\infty, -2) \cup (-2, 7) \cup (7, \infty)$ 3) x-int: $\frac{9}{2}$

4) x-int: $0, -2, 3$ 5) a) $y = 0$ b) $y = 5$ c) none

6) a) $(10, \frac{7\pi}{4})$ b) $(7\sqrt{2}, \frac{5\pi}{4})$ c) $(3, \frac{3\pi}{2})$ d) $(6, \frac{7\pi}{6})$

7) a) $(0, 3)$ b) $(\sqrt{2}, -\sqrt{2})$ c) $(-2\sqrt{3}, 2)$

8) a) b) c) d)

9) 26.5 N 10) a) 77.1 lbs b) 91.9 lbs 11) $32.5°$ 12) $\langle 8, -11 \rangle$ 13) $\sqrt{17}$

14) yes, orthogonal 15) 1114.72 ft-lbs 16) a) 0.8702 b) 1.7449 c) 0.2027

17) a) 0 b) no solution c) -3

18) a) $log_b \frac{x^3\sqrt{z}}{y^2}$ b) $log_b \frac{y^3\sqrt{x}}{z^2}$

19) a) 4x b) 3ab 20) a) -3 b) 3 21) a) ± 25 b) $\frac{1}{7}$ c) -4

22) a) x^2 b) x^5 c) e^3x 23) a) 7 + ln3 b) ln2 + 3 24) a) 48 b) $\frac{3 \pm \sqrt{5}}{2}$

25) \$45,902.92 26) a) 1.7712 b) 0.8295 27) a) 23 b) 166

28) a) arithmetic; 4 b) geometric; $\frac{3}{2}$ c) neither 29) 24,750 30) $\frac{2x^2}{3x^2+6}$ 31) 92

32) vertex: (3, 2) focus: $(-1, 2)$ 33) vertex: (0, 0) focus: $(0, -2)$

34) vertex: $(-1, 4)$ directrix: $y = 3$ 35) $(y-1)^2 = 8(x+3)$

36) center: $(-5, -9)$ foci: $(-5, -11); (-5, -7)$ 37) $\frac{x^2}{9} + \frac{y^2}{25} = 1$

38) center: $(-1, 5)$ vertices: $(-6, 5); (4, 5)$

39) center: $(-8, 3)$ vertices: $(-11, 3); (-5, 3)$ 40) $\frac{(x-5)^2}{25} - \frac{(y+1)^2}{9} = 1$