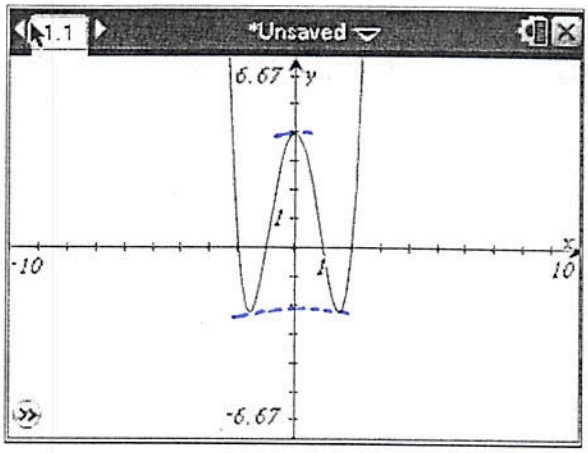
PreCal Review for 1st Semester Final Name: _____

Non-Calculator

1) List all relative max or min.



relative max: 4

relative min: -2

2) Find the Domain & Range of $f(x) = \sqrt{x-1} + 3$.

D: $[1, \infty)$

R: $[3, \infty)$

3) Find (f+g)(x) if $f(x) = x^3 - 3x + 5$ & $g(x) = x^2 - 5x - 6$

$(f+g)(x) = x^3 - 3x + 5 + x^2 - 5x - 6$

$= x^3 + x^2 - 8x - 1$

4) Find (f*g)(x) if $f(x) = (x+3)^2$ & $g(x) = x - 3$.

$(f \cdot g)(x) = (x+3)^2(x-3)$

$= (x^2+6x+9)(x-3)$

$= x^3 + 3x^2 - 9x - 27$

5) Find (fog)(x) if $f(x) = x^2 - 7$ & $g(x) = \sqrt{x+3}$

$(f \circ g)(x) = f(g(x)) = (\sqrt{x+3})^2 - 7$

$= x + 3 - 7 = x - 4$

6) Find the inverse of $h(x) = (x-3)^2 + 9$.

$x = (y-3)^2 + 9$

$x - 9 = (y-3)^2$

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

$\pm\sqrt{x-9} = y - 3$

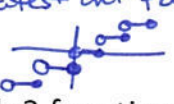
$y = \pm\sqrt{x-9} + 3$

$h^{-1}(x) = 3 \pm \sqrt{x-9}$

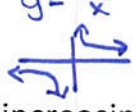
7) Graph 3 functions that are NOT continuous over Real Numbers.

Sample answers:

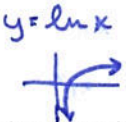
Greatest int function



$y = \frac{1}{x}$



$y = \ln x$

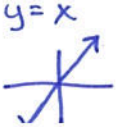


8) Graph 3 functions that are increasing on the interval (-∞,0).

Sample answers:

$y = x^3$

$y = x$

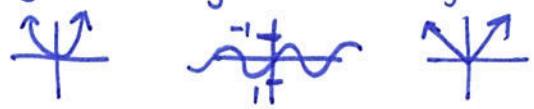


$y = -x^2$

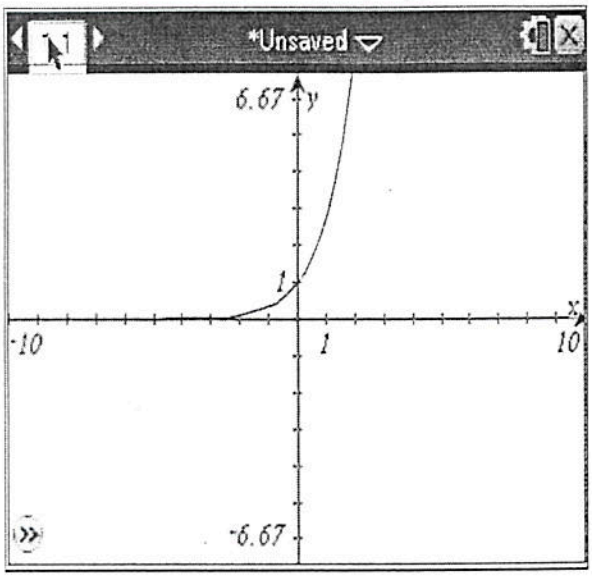
9) Graph 3 functions that are bounded below.

sample answers:

$y = x^2$ $y = \sin x$ $y = |x|$



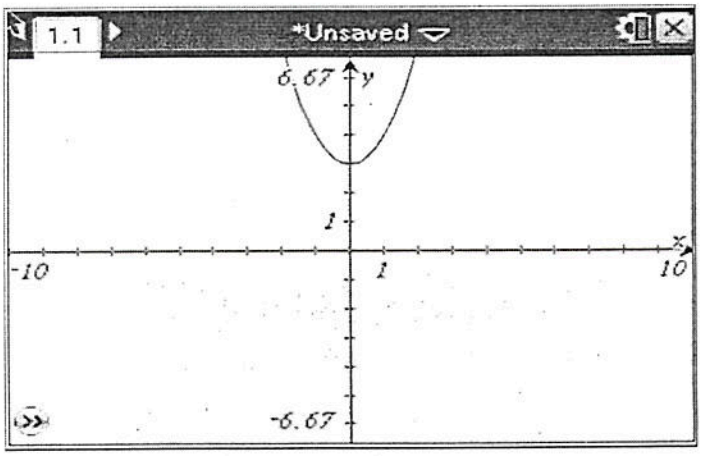
10) Find the function that produces this graph.



$y = e^x$

$y = x^2 + 3$

11) Find the function that produces this graph.



Calculator

12) Find the zeroes of $f(x) = x^2 - 5x + 3$

0.697 and 4.303

13) Determine the function that has zeroes @ $\frac{2}{3}, 3, 5$.

$f(x) = (3x-2)(x-3)(x-5)$

$f(x) = 3x^3 - 26x^2 + 61x - 30$

14) What is the end behavior of #13?

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

15) Determine the approximate intervals on which #13 is decreasing.

on (1.637, 4.141)

16) Reflect across the x-axis: $q(x) = (x-3)^2 - 5$

↳ makes function negative $\quad q(x) = -[(x-3)^2 - 5] = -[(x-3)^2 - 5]$

OR $-(x-3)^2 + 5$

17) What type of function does this describe?

quadratic

18) What type and what is the equation of the best fit regression curve?

# of Minutes	3	4	5	6	8
# of cars	8	15	24	35	63

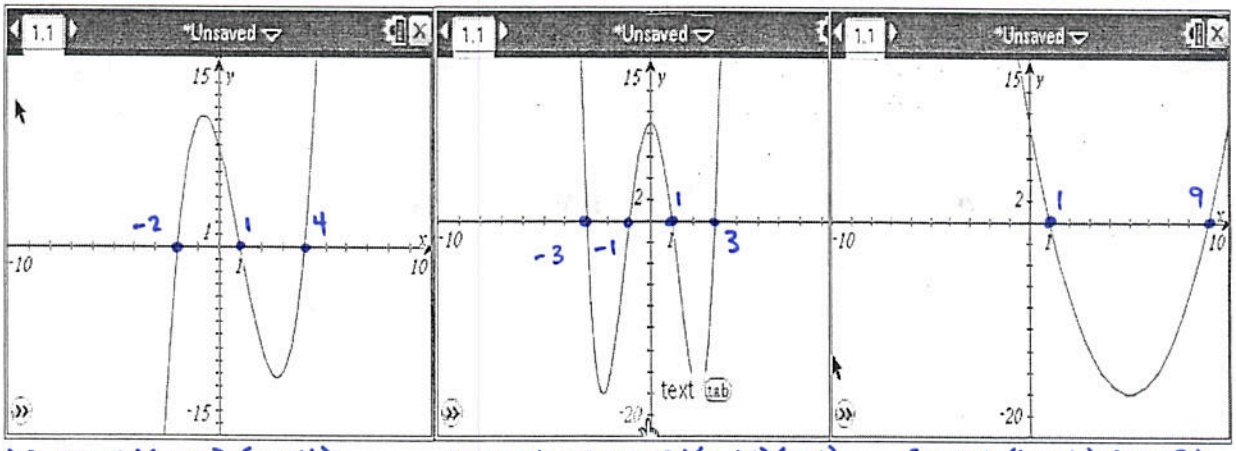
exponential $\quad y = 2.801(1.498)^x$ $\quad$ or $\quad$ quadratic $\quad y = x^2 - 1$

19) Graphite Inc. makes tennis racquets. If each racquet costs $53 to make with fixed overhead costs of $567,000, what is best fit regression curve?

Linear $\quad y = 53x + 567000$

Non-Calculator

20) Name a possible function that fits each graph.



$f(x) = (x+2)(x-1)(x-4)$ $\quad f(x) = (x+3)(x-3)(x+1)(x-1)$ $\quad f(x) = (x-1)(x-9)$

$f(x) = x^3 - 3x^2 - 6x + 8$ $\quad f(x) = x^4 - 10x^2 + 9$ $\quad f(x) = x^2 - 10x + 9$

21) *Given $x = 4$ is a root, find the rest of the zeroes for:* $f(x) = x^3 + x^2 - 16x - 16$

4	1	1	−16	−16
		4	20	16
	1	5	4	0

$x^2 + 5x + 4 = 0$

$(x+4)(x+1) = 0$

$x = -1, x = -4$

zeroes: $4, -1, -4$

22) Determine the polynomial of least degree given the roots: 3+i , -2

$x = 3+i, \quad x = 3-i, \quad x = -2$

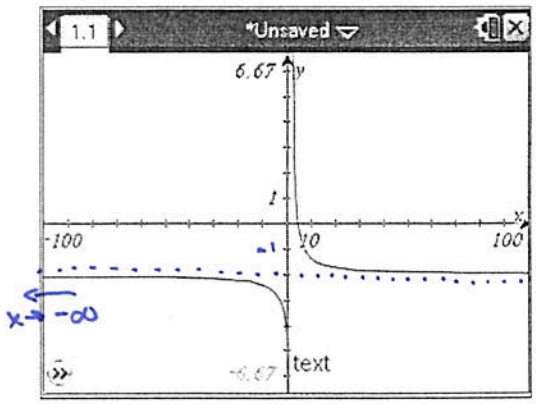
$p(x) = (x-3-i)(x-3+i)(x+2)$ → $f(x) = (x^2 - 6x + 10)(x+2)$

$f(x) = x^3 - 4x^2 - 2x + 20$

23) *Determine how many complex zero there are for* $g(x) = 3x^4 - 6x^2 + 5x - 11$

4 complex zeroes b/c degree of polynomial is 4

24) Determine the limit based upon the graph. $\lim_{x\to-\infty} g(x)$



$\lim_{x\to-\infty} g(x) = -2$

Calculator

25) *Solve for* q: $2q^3 - 10q = 5$ $q = -1.924,\ q = -.530,\ q = 2.453$

$c^2 - c + 3 = 0$

26) *Solve for* c: $c^2 + 3 = c$ $c = \frac{1 \pm i\sqrt{11}}{2}$

quadratic formula

27) *Find the vertical and horizontal asymptotes for* $h(x) = \frac{x-5}{x+3}$ V.A. @ $x = -3$, H.A. @ $y = 1$

28) *Determine all complex zeroes for:* $w(x) = x^4 - 8x^2 - 9$ $x = -3, 3, -i, i$

29) *How many real zeroes there are for:* $b(x) = 2x^3 + 3x^2 + 3x + 9$ one b/c there is one x-intercept.

30) *Describe the End Behavior of* $m(x) = -2x^3 - x + 1$

$\lim_{x\to-\infty} m(x) = \infty$ $\lim_{x\to\infty} m(x) = -\infty$

Non Calculator

31) *Evaluate:* $-7\log 10^3 - 3$ $= -7(3) - 3 = -24$

32) *Write* $\frac{9}{8} = a^{-2}$ *in logarithmic form.* $\log_a\left(\frac{9}{8}\right) = -2$

33) *Solve for* m: $\log_{\frac{1}{5}} \sqrt[3]{25}^5 = m$

$\left(\frac{1}{5}\right)^m = \left(\sqrt[3]{25}\right)^5$

$5^{-m} = 25^{5/3}$

$5^{-m} = (5^2)^{5/3}$

$5^{-m} = 5^{10/3}$

$-m = \frac{10}{3}$

$m = \frac{-10}{3}$

34) *Solve for* q: $\frac{1}{16} = 2^{q-3}$

$\frac{1}{2^4} = 2^{q-3}$

$2^{-4} = 2^{q-3}$

$-4 = q - 3$

$-1 = q$

35) *Condense the expression:* $2\,[5\log(x+2)+\log x]-\log(x+4)$ $= 2(\log(x+2)^5+\log x)-\log(x+4)$

$= 2(\log x(x+2)^5)-\log(x+4)$

$= \log x^2(x+2)^{10}-\log(x+4)$

$= \log\left(\frac{x^2(x+2)^{10}}{x+4}\right)$

36) *Solve for w:* $\log_5(2w-3)=2 \rightarrow 5^2=2w-3$

$25=2w-3$

$28=2w$

$14=w$

37) *Solve for a:* $-4=\log_a\frac{1}{16}$

$a^{-4}=\frac{1}{16} \rightarrow a^{-4}=2^{-4} \rightarrow a=2$

38) Identify the domain, range, x&y intercepts, and any asymptotes for $3^{x+2}-1$

D: $(-\infty,\infty)$ x-int: $0=3^{x+2}-1$ y-int: $y=3^{0+2}-1$ asymptotes:

R: $(-1,\infty)$ $1=3^{x+2}$ $y=3^2-1$ H.A. @ $y=-1$

$3^0=3^{x+2}$ $y=9-1$ no V.A.

$0=x+2$ $y=8$

$-2=x$

Calculator

39) *Solve for x:* $\ln(x+4)+\ln(x-3)=2\ln 3$ $x=4.110$

40) *Find the Domain & Range of:* $f(x)=e^x+7$ D: $(-\infty,\infty)$

R: $(7,\infty)$

41) *Find the Domain, Range, X&Y Intercepts, and Asymptotes of:*

$$f(x)=-1+\log_5(x+3)$$

D: $(-3,\infty)$ x-int: $x=-2$ asymptotes: $x=-3$ V.A.

R: $(-\infty,\infty)$ y-int: $y=-.683$ no H.A.

42) The # of bacteria in a petri dish after "t" hours is $B=100e^{kt}$ *where* $t=0$ represents the time 12pm. At 6am the # of bacteria was 42. ($t=-6$)

a) Find "k"

b) Using "k", find the # of bacteria at 8pm. ($t=8$)

c)

$42=100e^{k(-6)}$

$\frac{42}{100}=e^{-6k}$ $\rightarrow \ln\left(\frac{42}{100}\right)=-6k$

$.145=k$ ↳ store the value of k

$B=100e^{.145(8)}$

$B=317.932$

so, 318 bacteria

43) $pH=-log[H^+]$

a) Find the pH if $[H^+]3.98\times10^{-9}$

b) Find $[H^+]$ if pH=2.0

$pH=-\log[3.98\times10^{-9}]$

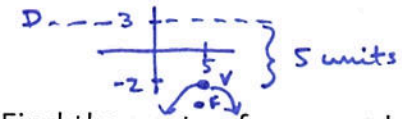
$pH=8.400$

$2.0=-\log[H^+]$

$10^{-2.0}=10^{\log[H^+]} \rightarrow .01=[H^+]$

Non-Calculator

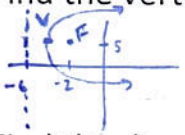
44) Find the focus for a parabola with vertex (5,-2) & directrix y=3.



F: (5, -2-5)

Focus: (5, -7)

45) Find the vertex for a parabola with focus (-2,5) & directrix x=-6.



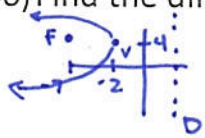
from Focus to directrix = 4 units

Focus to Vertex = $\frac{4}{2}=2$ units

Vertex: (-2-2, 5)

(-4, 5)

46) Find the directrix for a parabola with vertex (-2, 4) & focus (-7, 4).



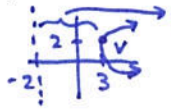
Focus to vertex: 5 units

Vertex to Directrix: 5 units

Directrix: $x=-2+5$

$x=3$

47) Write the equation for a parabola with vertex (3, 2) & directrix x=-2.



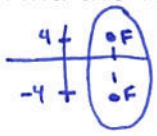
$p = 5$

$(y-k)^2 = 4p(x-h)$

$(y-2)^2 = 4(5)(x-3)$

$(y-2)^2 = 20(x-3)$

48) Find the vertices of an ellipse with foci (1, 4), (1,-4) & major axis of 13.



center : (1, 0)

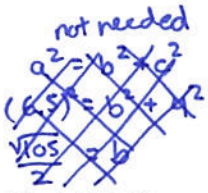
vertices: (1, 6.5)
(1, -6.5)

c = foci to decenter

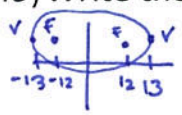
$c = 4$

$2a = 13$

$a = 6.5$



49) Write the equation for an ellipse with vertices (13, 3), (-13, 3) & foci (12,3), (-12,3).



center : (0, 3)

$a = 13$

$c = 12$

$a^2 = b^2 + c^2$

$13^2 = b^2 + 12^2$

$5 = b$

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

$\frac{x^2}{169} + \frac{y}{25} = 1$

50) Draw the graph and write the equation of an ellipse with a major axis of 12, minor axis of 10 & center at (2, -1) .

$2a = 12$

$a = 6$

$2b = 10$

$b = 5$

$\frac{(x-2)^2}{36} + \frac{(y+1)^2}{25} = 1$ or $\frac{(y+1)^2}{36} + \frac{(x-2)^2}{25} = 1$

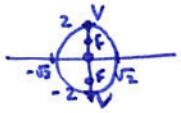
51) Draw & Label the graph of $\frac{12x^2}{24} + \frac{6y^2}{24} = \frac{24}{24}$.

$\frac{x^2}{2} + \frac{y^2}{4} = 1 \rightarrow \frac{y^2}{4} + \frac{x^2}{2} = 1$

$4 = 2 + c^2$

$2 = c^2$

$\sqrt{2} = c$



center : (0, 0)

vertices: (0, 2) (0, -2)

foci : $(0, \sqrt{2})$ $(0, -\sqrt{2})$

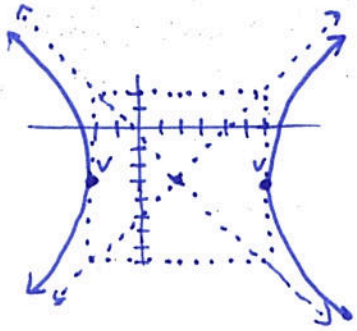
52) Find the eccentricity of #51.

$e = \frac{c}{a} = \frac{\sqrt{2}}{2}$

53) Draw & Label the graph of $\frac{25(x-2)^2}{400} - \frac{16(y+3)^2}{400} = \frac{400}{400}$.

$\frac{(x-2)^2}{16} - \frac{(y+3)^2}{25} = 1$

vertices: (-2, -3) (6, -3)



54) Find the eccentricity of #53.

$c^2 = a^2 + b^2$

$c^2 = 16 + 25$

$c = \sqrt{41}$

$e = \frac{c}{a} = \frac{\sqrt{41}}{4}$

55) Find the vertices & foci of $\frac{9y^2}{36} - \frac{6x^2}{36} = \frac{36}{36}$.

$\frac{y^2}{4} - \frac{x^2}{6} = 1$

$a^2 = 4$

$a = 2$

$c^2 = 6 + 4$

$c = \sqrt{10}$

vertices: (0, 2) (0, -2)

foci : $(0, \sqrt{10})$ $(0, -\sqrt{10})$

56) Write the equation for a hyperbola with foci (10, 3), (-10, 3) & vertices (6, 3), (-6, 3).

center (0, 3)

$\frac{(x-0)^2}{6^2} - \frac{(y-3)^2}{8^2} = 1$

$\frac{x^2}{36} - \frac{(y-3)^2}{64} = 1$

$c = 10$

$10^2 = 6^2 + b^2$

$100 = 36 + b^2$

$64 = b^2$

$8 = b$

$a = 6$

57) Find the equation of the asymptotes of #56.

asymptotes: $y - k = \pm \frac{b}{a}(x-h)$

$y - 3 = \pm \frac{8}{6}(x-0)$

$y = \pm \frac{4}{3}x + 3$