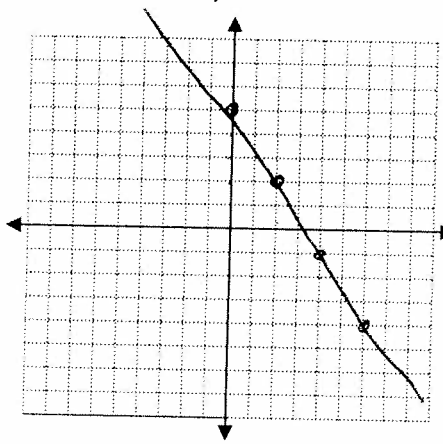


SEMESTER 1

REVIEW

Unit 1: Intro to Pre-Calc

1. Linear Functions

Slope Intercept Form	Standard Form	Point Slope Form
<p>a. Write the equation of the line in slope intercept form that is perpendicular to $y = 2x - 5$ and contains $(-50, 10)$</p> <p>$m = 2$ $perp = -\frac{1}{2}$</p> <p>$y - y_1 = m(x - x_1)$ $y - 10 = -\frac{1}{2}(x + 50)$ $y - 10 = -\frac{1}{2}x - 25$ $y = -\frac{1}{2}x - 15$</p>	<p>b. Graph $3x + 2y = 10$</p> <p>$2y = -3x + 10$ $y = -\frac{3}{2}x + 5$</p> 	<p>c. Write the equation of the line in point slope form that contains the points $(-50, -49)$ and $(35, 53)$</p> <p>$m = \frac{53 + 49}{35 + 50} = \frac{102}{85} = \frac{6}{5}$</p> <p>$y + 49 = \frac{6}{5}(x + 50)$</p> <p>or</p> <p>$y - 53 = \frac{6}{5}(x - 35)$</p>

2. Regression (Best Fit Line/Curve)

The following table gives the number of motor vehicle thefts (in thousands) in the U.S. for the years 1983 - 1993. $x = 1$ represents 1983. Use the regression capabilities of your calculator to fit a cubic model to this data.

Year	1	3	4	7	8	9	10	11
Vehicle Thefts	1008	1103	1224	1565	1636	1662	1611	1561

a. Graph the data with a friendly window. Record here

b. Use regression and write the equation of your model.
(Round to three decimal places)

$$V(t) = -2.29x^3 + 34.13x^2 - 50.24x + 1021.85$$

c. What does $V(5.5)$ mean? Find it. 1396.05

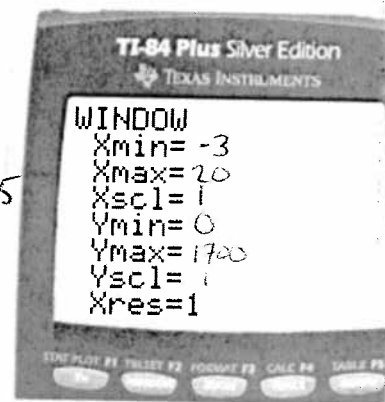
d. Find the time(s) in which there will be 1400 thousand auto thefts.

5.5 yrs \rightarrow 1988/1989 11.85 yrs \rightarrow 1994/1995

e. What does the y-intercept mean in this situation?

of thefts in 1982

f. Predict the auto thefts in 1995. $x = 12$ so 1369.7 thefts



3. Factoring Basics: Solve the following by factoring.

$x^2 - 9x = 0$

$x(x - 9) = 0$

$x = 0$ or

$x - 9 = 0$
 $x = 9$

b. $x^2 - 9x - 112 = 0$

$(x + 7)(x - 16) = 0$

$x + 7 = 0$ or $x - 16 = 0$

$x = -7$

$x = 16$

c. $2x^2 - 17x = -35$

$2x^2 - 17x + 35 = 0$

$(2x^2 - 10x) + (-7x + 35) = 0$

$2x(x - 5) + (-7)(x - 5) = 0$

$(2x - 7)(x - 5) = 0$

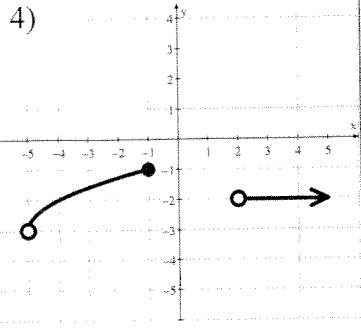
$x = 7$
 $x = 5$

$x = 7$
 $x = 5$

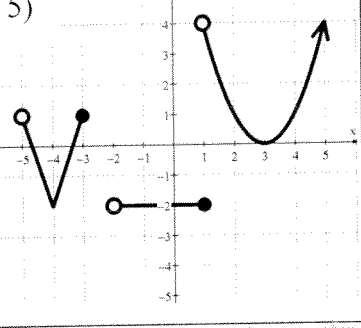
$x = 5$

Unit 2: Functions and Limits

For 4-5, identify the domain and range of each function. Use both interval notation and inequality notation.



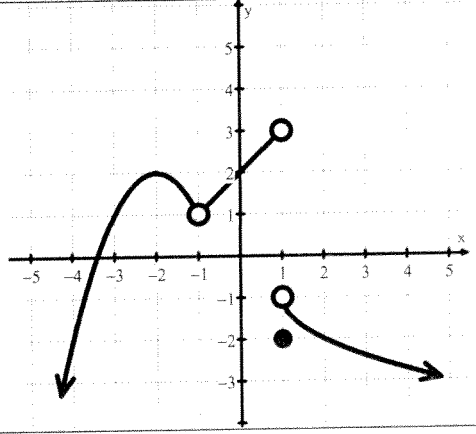
4)
Domain:
 Interval: $(-5, -1) \cup (-1, 2)$
 Inequality: $-5 < x < -1$ or $x > -1$
Range:
 Interval: $(-3, -1]$
 Inequality: $-3 < y \leq -1$



5)
Domain:
 Interval: $(-5, -3] \cup (-2, 5)$
 Inequality: $-5 < x \leq -3$ or $x > -2$
Range:
 Interval: $[-2, \infty)$
 Inequality: $y \geq -2$

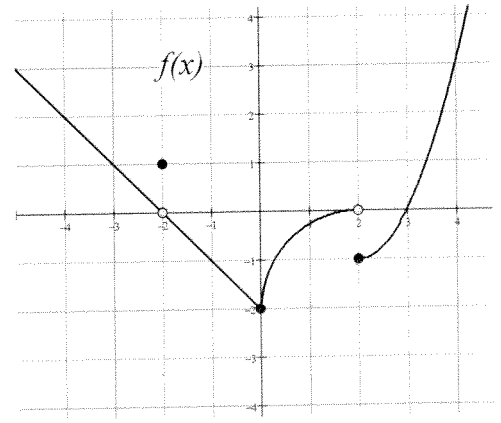
6) Using the graph on the right, give the value of each statement.

- a. $\lim_{x \rightarrow 1^-} f(x) = 3$
- b. $f(-1) = \text{DNE}$
- c. $\lim_{x \rightarrow -1} f(x) = 1$
- d. $\lim_{x \rightarrow -2^-} f(x) = 2$
- e. $f(1) = -2$
- f. $\lim_{x \rightarrow 1^+} f(x) = -1$



For questions 7-14, refer to the graph of $f(x)$

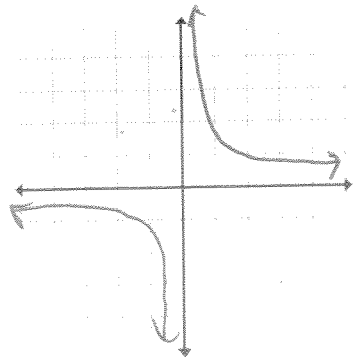
- 7. State the intervals where $f(x)$ is continuous.
 $(-\infty, -2)$
 $(-2, 2)$ $(2, \infty)$
- 8. State the values of x where the function is discontinuous and label them as removable or non-removable discontinuities. $x = -2$ and $x = 2$
 Removable
- 9. $\lim_{x \rightarrow 0} f(x) = -2$
- 10. $\lim_{x \rightarrow 2^+} f(x) = -1$
- 11. $\lim_{x \rightarrow 2^-} f(x) = 0$
- 12. $\lim_{x \rightarrow 2} f(x) = \text{DNE}$
- 13. $f(0) = -2$
- 14. $\lim_{x \rightarrow -2} f(x) = 0$



For 15-16, graph the function and determine if it has points of discontinuity. If there is a discontinuity, tell what type of discontinuity it is and its x -value. Clearly mark all asymptotes with a dotted line.

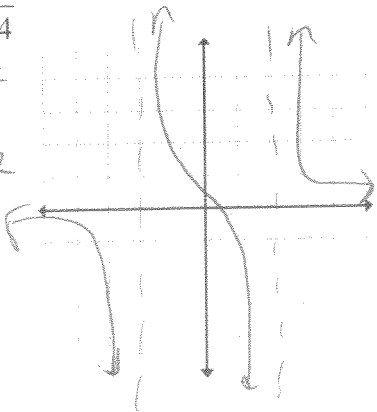
15. $f(x) = \frac{2}{x}$

NON REMOVABLE DISCONTINUITY at $x=0$
 (Vert. Asym.)



16. $f(x) = \frac{x}{x^2 - 4}$

NON REMOVABLE Discontinuity at $x = -2, 2$
 (Vert. Asy)



Unit 3: Function Analysis

For 17-19, find the domain of the given function. Use interval notation.

17. $f(x) = \sqrt{10-x}$
 $10-x \geq 0$
 $10 \geq x$

$[-\infty, 10]$

18. $f(x) = \frac{x}{x-5}$
 $x \neq 5$

$(-\infty, 5) \cup (5, \infty)$

19. $f(x) = \frac{\sqrt{x-2}}{(x+7)(x-8)}$
 $x \geq 0; x \geq 2$
 $x \neq 7; x \neq 8$

$[2, 7) \cup (8, \infty)$

For 20-21, find the range of the function. Use interval notation.

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

$[4, \infty)$

21. $f(x) = \sqrt{9+x}$

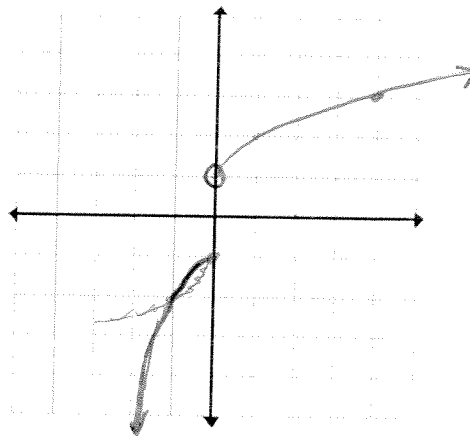
$[0, \infty)$

22. Sketch the piecewise function $f(x) = \begin{cases} x^3 - 1 & x \leq 0 \\ \sqrt{x+1} & x > 0 \end{cases}$

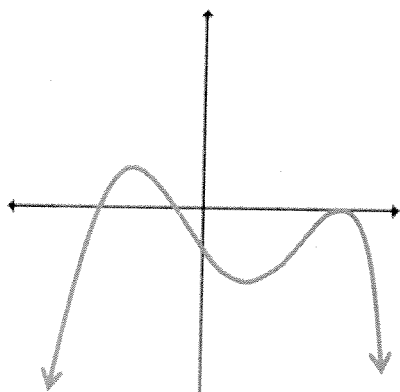
a. $f(2) = \sqrt{2+1}$

b. $f(-2) = (-2)^3 - 1 = -9$

c. $f(0) = (0)^3 - 1 = -1$

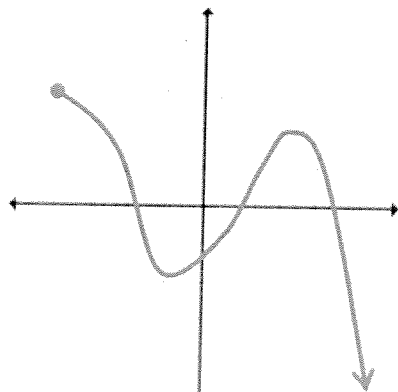


23. Label all local and absolute maximums and minimums.



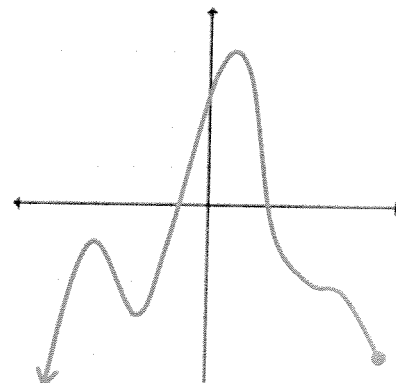
Abs max @ $x = -2$ Relat. Min @ $x = 1$
 Relative max @ $x = 3$.

b.



Abs max @ $x = -4$
 Rel max @ $x = 2$
 Rel min @ $x = -1$

c.



Abs max @ $x \approx 7$
 Rel max @ $x = -3$
 Rel min @ $x = -2$

Unit 4: Function Algebra

24. $f(x) = 3x + 11$ and $g(x) = 5x - 1$

$f \cdot g = (3x+11)(5x-1)$
 $15x^2 - 3x + 55x - 11$
 $15x^2 + 52x - 11$

$\frac{f}{g} = \frac{3x+11}{5x-1}$

25. $f(x) = 4x^2 + 2x + 3$; $g(x) = 2x - 4$

$f \circ g = 4(2x-4)^2 + 2(2x-4) + 3$
 $= 4(2x-4)(2x-4) + 4x - 8 + 3$
 $= 4(4x^2 - 16x + 16) + 4x - 5$
 $= 16x^2 - 64x + 64 + 4x - 5$
 $= 16x^2 - 60x + 59$

For 26, confirm that f and g are inverses by showing the $f(g(x)) = x$

26. $f(x) = 2x + 9$ and $g(x) = \frac{x-9}{2}$

$$f(g(x)) = 2\left(\frac{x-9}{2}\right) + 9$$

$$f(g(x)) = x$$

For 27-32, if $f(x) = 2x - 5$ and the $g(x) = x^2 + 2x - 3$, find the following...

27. $f(2)$

$$2(2) - 5$$

$$4 - 5$$

$$f(2) = -1$$

28. $g(-2)$

$$(-2)^2 + 2(-2) - 3$$

$$4 - 4 - 3$$

$$g(-2) = -3$$

29. $f(g(0))$

$$g(0) = 0^2 + 2(0) - 3$$

$$g(0) = -3$$

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

$$= -6 - 5$$

$$f(g(0)) = -11$$

30. $f - g$

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

$$f - g = -x^2 - 2$$

31. $f(x+h)$

$$f(x+h) = 2(x+h) - 5$$

$$f(x+h) = 2x + 2h - 5$$

32. $(f+g)(2)$

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

$$(f+g)(2) = x^2 + 4x - 8$$

$$= 2^2 + 4(2) - 8$$

$$= 4 + 8 - 8$$

$$(f+g)(2) = 4$$

33. Is $f(x) = \frac{x+1}{x^2-1}$ even, odd, or neither. Justify your answer!

$$f(-x) = \frac{-x+1}{(-x)^2-1} = \frac{-x+1}{x^2-1} = -\frac{x-1}{x^2-1}$$

so NEITHER because $f(-x) \neq -f(x)$
or $f(-x) \neq f(x)$

Transformations

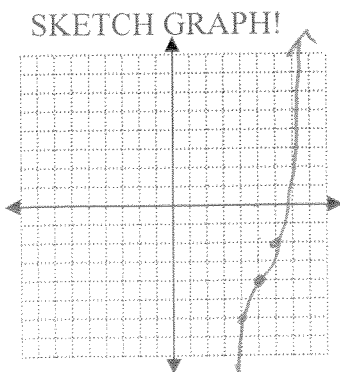
34. $y = 2(x-5)^3 - 4$

Name function: CUBIC

Translation: RIGHT 5
DOWN 4

Scale: VERTICAL STRETCH
OF 2

Reflection: NONE



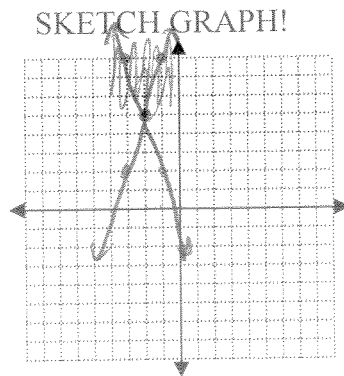
35. $f(x) = -|3x + 6| + 5$

Name function: ABS. VALUE

Translation: ~~RIGHT 2~~ LEFT 2
~~DOWN 5~~ UP 5

Scale: HORIZONTAL SHRINK $\frac{1}{3}$

Reflection: ABOUT X-AXIS



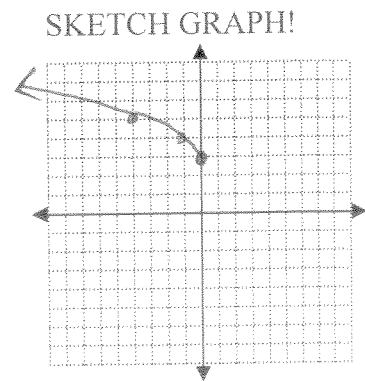
36. $y = \sqrt{-x} + 3$

Name function: SQUARE ROOT

Translation: UP 3

Scale: NONE

Reflection: ABOUT Y-AXIS



Unit 5: Polynomials

Graph on your calculator to solve the following.

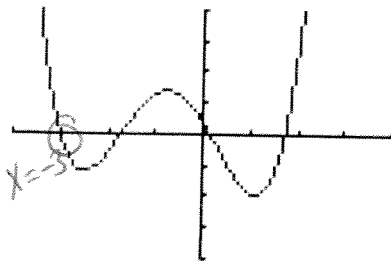
37. $0 = x^4 + 2x^2 - 3x - 1$

$x = -0.279$
OR 1.157

38. $3x^6 - 2x^5 = 8 - 3x^2$

$3x^6 - 2x^5 + 3x^2 - 8 = 0$

39. Use the graph of the function to determine at least one zero, then find the exact values of all the zeros using the Factor Theorem. $f(x) = 7x^4 + 20x^3 - 24x^2 - 60x + 9$



WINDOW
Xmin=-4
Xmax=4
Xscl=1
Ymin=-100
Ymax=100
Yscl=25
Xres=1

$$\begin{array}{r} -3 \overline{) 7 \ 20 \ -24 \ -60 \ 9} \\ \underline{7 \ -21 \ 3 \ +63 \ -9} \\ 7 \ -1 \ -21 \ +3 \\ \underline{7 \ -7 \ -21 \ +3} \\ 7 \ -1 \ -21 \ +3 \\ \underline{7 \ -7 \ -21 \ +3} \\ 0 \end{array}$$

$7x^3 - x^2 - 21x + 3$
 $(7x^3 - x^2) + (-21x + 3)$
 $x^2(7x - 1) - 3(7x - 1)$
 $(x^2 - 3)(7x - 1)$

FACTORS: $(x+3)(x^2-3)(7x-1)$
SO: $x = -3, \pm\sqrt{3}, \frac{1}{7}$

$x^2 - 3 = 0$ $7x - 1 = 0$
 $x^2 = 3$ $7x = 1$
 $x = \pm\sqrt{3}$ $x = \frac{1}{7}$

40. Factor the following.

a. $6x^2 + 13xy - 5y^2$ $x-30$
 $(6x^2 - 3xy) + (10xy - 5y^2)$ $+ 13$
 $3x(2x - y) - 5y(2x - y)$
 $(3x - 5y)(2x - y)$

b. $(5x^3 - 30x^2) + (8x + 48)$
 $5x^2(x - 6) - 8(x - 6)$
 $(5x^2 - 8)(x - 6)$

c. $216 + x^3$

Not Factorable

41. Factor to solve the following.

a. $4x^4 + 64x = 0$
 $4x(x^3 + 16) = 0$

$4x = 0$
 $x = 0$

$x^3 + 16 = 0$
 $x^3 = -16$
 $x = \sqrt[3]{-16}$
 $x = -2\sqrt[3]{2}$

b. $x^3 - 6x^2 + 8x = 0$
 $x(x^2 - 6x + 8) = 0$
 $x(x - 4)(x - 2) = 0$

$x = 0$ $x - 4 = 0$ $x - 2 = 0$
 $x = 0$ $x = 4$ $x = 2$

c. $x^4 - 11x^2 = -30$

$x^4 - 11x^2 + 30 = 0$
 $(x^2 - 6)(x^2 - 5) = 0$
 $x^2 - 6 = 0$ $x^2 - 5 = 0$
 $x^2 = 6$ $x^2 = 5$
 $x = \pm\sqrt{6}$ $x = \pm\sqrt{5}$