

Pre-Calculus First Trimester Review

Non-Calculator

Remember, you must show all work to get credit for these problems, (extra credit on the exam).

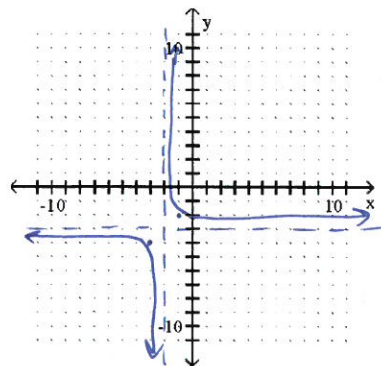
For the following:

- (a) Identify the parent
- (b) State the transformation rule(s).
- (c) Sketch the graph.

[1.5] 1. $f(x) = \frac{1}{x+2} - 3$

a) parent $\frac{1}{x}$

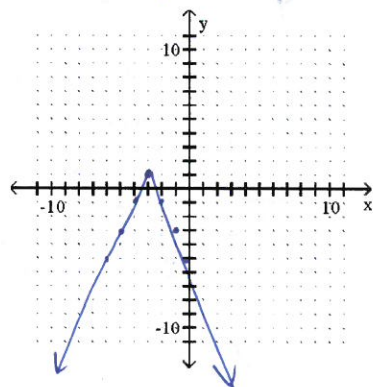
b) left 2 down 3



[1.4] 2. $f(x) = -2|x+3| + 1$

a) parent $|x|$
left + 3 up 1

b) flip x-axis v. stretch 2



[1.5] 3. $f(x) = -2(x+1)^2 + 4$

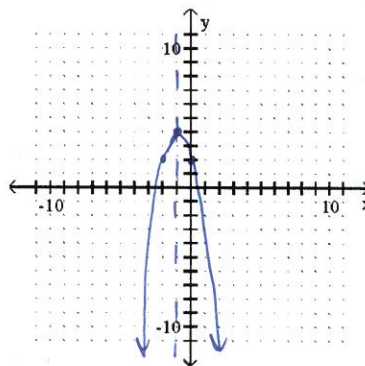
[2.1]

a) parent x^2

b) left + 1 up 4
flip v. stretch 2

Vertex: $(-1, 4)$

Axis of symmetry: $x = -1$



Solve. Check for extraneous solutions.

[P3] 6. $2(5-2y) - 3(1-y) \geq y+1$

$$10 - 4y - 3 + 3y \geq y + 1$$

$$7 - y \geq y + 1$$

$$6 \geq 2y$$

$$3 \geq y$$

$$y \leq 3$$

[P3] 7. $\left(\frac{x-2}{3} + \frac{x+5}{2} = \frac{1}{3}\right) 6$

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

$$2x - 4 + 3x + 15 = 2$$

$$5x + 11 = 2$$

$$5x = 9$$

$$x = \frac{9}{5}$$

[P5] 8. $|2x-5| > 4.2$ create two eqns

$$2x - 5 > 4.2 \quad 2x - 5 < -4.2$$

$$2x > 9.2 \quad 2x < 1.2$$

$$x > 4.6 \quad x < 0.6$$

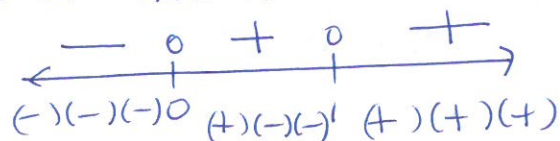
$$(-\infty, 0.6) \cup (4.6, \infty)$$

[2.9] 9. $x^3 - 2x^2 + x \geq 0$

$$x(x^2 - 2x + 1)$$

$$x(x-1)(x-1)$$

$$[0, \infty)$$



SIGN CHART

[P5] 10. $\left[\frac{3x}{x+1} + \frac{5}{x-2} = \frac{15}{x^2-x-2} \right]^{(x+1)(x-2)}$
 [2.7]

$$3x(x-2) + 5(x+1) = 15$$

$$3x^2 - 6x + 5x + 5 = 15$$

$$3x^2 - x - 10 = 0$$

quad, factor

$x = -5/3$	$x = 2$ extraneous
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[P5] 12. $-3 \leq 1 - 2x < 7$
 $\begin{matrix} -1 & -1 & -1 \end{matrix}$

$$\frac{-4}{-2} \leq \frac{-2x}{-2} < \frac{6}{-2}$$

$$2 \geq x > -3$$

$-3 < x \leq 2$

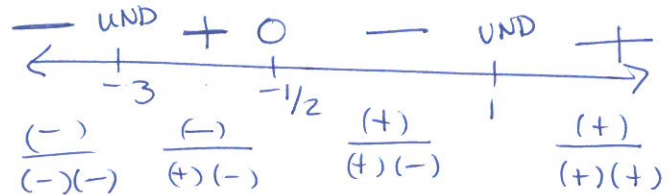
[P5] 11. $4x^2 - 7x + 5 = 0$ quad form or factor

$$\frac{7 \pm \sqrt{(-7)^2 - 4(4)(5)}}{2(4)}$$

$$\frac{7 \pm \sqrt{-31}}{8} = \boxed{\frac{7 \pm i\sqrt{31}}{8}}$$

[2.9] 13. $\frac{2x+1}{(x+3)(x-1)} \leq 0$

$x = -1/2$ Zero $x = -3$ VA $x = 1$ VA



$$(-\infty, -3) \cup \left[-\frac{1}{2}, 1\right)$$

[P1] Simplify. Express your answer without negative exponents.

14. $\frac{(uv^{-2})^{-3}}{u^{-5}v^2} = \frac{u^{-3}v^6}{u^{-5}v^2} = \frac{u^5v^6}{u^3v^2} = \boxed{u^2v^4}$

15. $\frac{4a^3b}{a^2b^3} \cdot \frac{3b^2}{2a^2b^4} = \frac{12a^3b^3}{2a^4b^7} = \boxed{\frac{6}{ab^4}}$

[1.2] Find the domain. Express the answer in interval notation.

16. $f(x) = \sqrt{x^2+3} \geq 0$
 \mathbb{R}
 all real #s
 $(-\infty, \infty)$

17. $f(x) = \frac{\sqrt{x}}{x-5}$
 $\leftarrow x \geq 0$
 $\leftarrow x \neq 5$
 $[0, 5) \cup (5, \infty)$

[1.3] Prove algebraically whether the function is even, odd, or neither.

plug in $(-x)$

18. $f(x) = 3x^3 - 2x$

$$\begin{aligned} f(-x) &= 3(-x)^3 - 2(-x) \\ &= 3(-x^3) + 2x \\ &= -3x^3 + 2x \\ \therefore \text{ODD } -f(x) \end{aligned}$$

19. $f(x) = -2x^4 - 4x + 7$

$f(x) = f(-x)$ EVEN
 $f(x) = -f(x)$ ODD

$$\begin{aligned} f(-x) &= -2(-x)^4 - 4(-x) + 7 \\ &= -2x^4 + 4x + 7 \\ &\text{same opp same} \end{aligned}$$

\therefore NEITHER

[1.4] Given $f(x) = (x-4)^2$, $g(x) = 2x - 3$ and $h(x) = \sqrt{x+5}$ Find and simplify the answer.

20. $f \circ h(4) = f(h(4))$
 $= f(3)$
 $= (3-4)^2 = \boxed{1}$

21. $g(f(x)) = g((x-4)^2)$
 $= \boxed{2(x-4)^2 - 3}$

22. $f + g$

$(x-4)^2 + 2x - 3$ FINAL ANS.
OR FOIL

$x^2 - 8x + 16 + 2x - 3$

$x^2 - 6x + 13$

23. fg $f \cdot g$

$(x-4)^2 \cdot (2x-3)$ FINAL ANS
OR

$(x^2 - 8x + 16)(2x - 3) = 2x^3 - 16x^2 + 32x - 3x^2 + 24x - 48$

[1.4] 24. Given: $f(x) = x^3 + 2$. Find $f^{-1}(x)$.

$$\begin{aligned} y &= x^3 + 2 \\ x &= y^3 + 2 \\ x - 2 &= y^3 \\ \sqrt[3]{x-2} &= y \end{aligned}$$

$f^{-1}(x) = \sqrt[3]{x-2}$

Switch x & y , solve for y .

$2x^3 - 19x^2 + 56x - 48$

[2.3] Describe the end behavior of the polynomial using **limit** notation.

25. $f(x) = -2x^3 + 4x^2 + 1$

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

$x \rightarrow -\infty$

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

26. $f(x) = 3x^4 + x^2 - 5$

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

$x \rightarrow -\infty$

$\lim_{x \rightarrow \infty} f(x) = \infty$

$x \rightarrow \infty$

[2.3] Find the zeros of the function algebraically.

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

quadratic formula or factor

$(3x+5)(x-1) = 0$

$x = -5/3 \quad x = 1$

[2.4] Find the zeros of the function and write the function as a product of linear and irreducible quadratic factors all with real coefficients.

28. $f(x) = x^3 - x^2 - x - 2$, given that $x = 2$ is a zero of the function.

$$\begin{array}{r|rrrr} 2 & 1 & -1 & -1 & -2 \\ & & 2 & 2 & 2 \\ \hline & 1 & 1 & 1 & \otimes \end{array}$$

$$x^2 + x + 1 = 0$$

$$\frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2(1)} = \frac{-1 \pm \sqrt{-3}}{2} = \frac{-1 \pm i\sqrt{3}}{2}$$

factor $(x-2)(x^2+x+1)$

29. $f(x) = x^4 + 3x^3 - 3x^2 + 3x - 4$, given that $x = 1$ and $x = -4$ are zeros of the function.

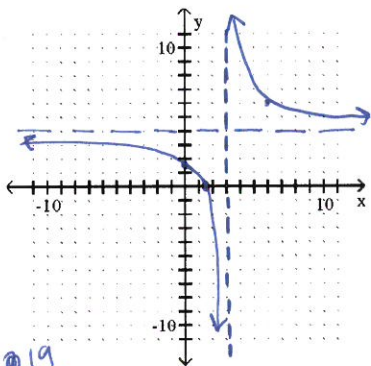
$$\begin{array}{r|rrrrr} 1 & 1 & 3 & -3 & 3 & -4 \\ & & 1 & 4 & 1 & 4 \\ \hline -4 & 1 & 4 & 1 & 4 & \otimes \\ & & -4 & 0 & -4 & \\ \hline & 1 & 0 & 1 & \otimes & \\ & & & & & x^2 + 1 \end{array}$$

factor $(x-1)(x+4)(x^2+1)$

[2.7] Find (if it exists) the a) asymptotes and b) intercepts of the function. Sketch the graph by hand.

30. $g(x) = \frac{4x-5}{x-3}$

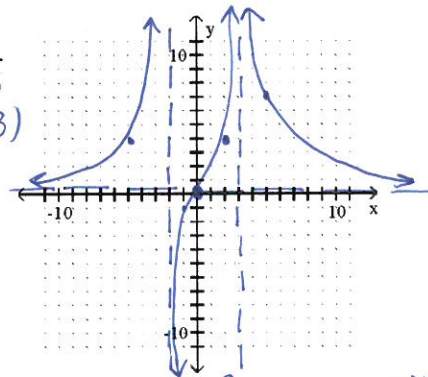
$x=3$ VA
 $y=4$ HA



$x=6 \frac{19}{3}$

31. $g(x) = \frac{2x^2}{x^2-x-6} = \frac{2x^2}{(x+2)(x-3)}$

$x = -2, 3$
 $y = 0$ H.A.

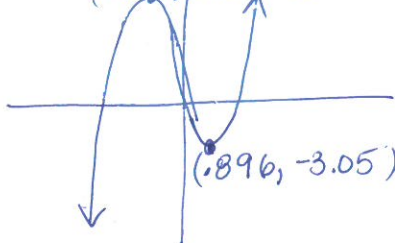


$x = -1 \frac{2}{3}, x = 2 \frac{8}{3}, x = 5 \frac{100}{72}$
 $x = -5 \frac{100}{-3 \cdot 8}$

Graphing Calculator

[1.2] 33. Find all a) local maxima and minima and b) identify intervals on which the function is increasing, decreasing, or constant.

$f(x) = x^3 + 2x^2 - 6x$ graph
 $(-2.23, 12.24)$



local max $(-2.23, 12.24)$

local min $(.896, -3.05)$

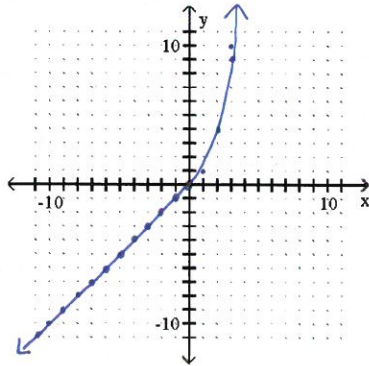
increasing: $(-\infty, -2.23) \cup (.896, \infty)$

decreasing: $(-2.23, .896)$

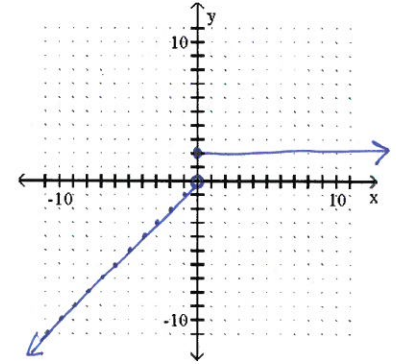
[1.3] Sketch the graph of the piecewise-defined function. State whether the function is continuous or discontinuous at $x = 0$.

34. $f(x) = \begin{cases} x & \text{if } x \leq 0 \\ x^2 & \text{if } x > 0 \end{cases}$

continuous
@
 $x=0$



35. $f(x) = \begin{cases} -|x| & \text{if } x < 0 \\ 2 & \text{if } x \geq 0 \end{cases}$



[1.6] 36. Sue invested \$10,000, part at 3.6% annual interest and the balance 7.8% annual interest. How much is invested at each rate if a 1-year interest payment is \$667.02?

$x = \$2690$
in 3.6%
 $y = \$7310$
in 7.8%

$$\begin{aligned} .036x + .078y &= 667.02 \\ .036x + .078(10,000 - x) &= 667.02 \\ .036x + 780 - .078x &= 667.02 \\ -.042x + 780 &= 667.02 \\ -.042x &= -112.98 \end{aligned}$$

$$\begin{aligned} x + y &= 10,000 \\ y &= 10,000 - x \\ x &= 3.6\% \text{ interest } \$ \\ y &= 7.8\% \text{ interest } \$ \end{aligned}$$

[1.6] 37. Joe Pearlman received a 3.5% pay decrease. His salary after the decrease was \$27,985. What was his salary before the decrease?

$$\frac{.965(\text{old})}{.965} = \frac{27,985}{.965}$$

$\text{old} = \$29,000$

[2.1] 38. Write an equation for the linear function f with $f(-3) = -2$ and $f(4) = -8$.

Express your answer in slope-intercept form.

$(-3, -2)$ $(4, -8)$

$$\frac{-8 - (-2)}{4 - (-3)} = \frac{-6}{7} = \text{slope}$$

$$y + 2 = -\frac{6}{7}(x + 3)$$

$$y = -\frac{6}{7}x - \frac{18}{7} - 2$$

$y = -\frac{6}{7}x - \frac{32}{7}$

[2.2] 39. Write the statement as a power function equation and answer the question. The electrical resistance of a wire varies directly as its length and inversely as the square of the diameter of the wire. Suppose 50 mm of a wire of diameter 3 mm has a resistance of 8Ω . What is the resistance of 40 mm of the same type of wire if the diameter is 4 mm?

$$R = \frac{kL}{d^2}$$

$$8 = \frac{k(50)}{3^2} \Rightarrow 8 = \frac{k(50)}{9} \Rightarrow 72 = k(50)$$

$k = 1.44$

$$R = \frac{1.44L}{d^2}$$

$$R = \frac{1.44(40)}{4^2} = \boxed{3.6 \Omega = \text{resistance}}$$

[2.4 & 2.6] Find a polynomial equation with the given zeros. Express answers in standard form.

40. $\frac{1}{3}, -2, 5$

$$(3x-1)(x+2)(x-5)$$

$$(3x-1)(x^2-3x-10)$$

$$3x^3 - 9x^2 - 30x - x^2 + 3x + 10$$

[2.5] 41. Write in $a + bi$ form: $\frac{2+4i}{3-2i}$

$$3x^3 - 10x^2 - 27x + 10$$

b) $3, 4i$

$$(x-3)(x-4i)(x+4i)$$

$$(x-3)(x^2+16)$$

$$x^3 + 16x^2 - 3x^2 - 48$$

$$x^3 + 13x^2 - 48$$

Write in $a+bi$ form $\frac{(2+4i)}{(3-2i)}$.

$$\frac{(2+4i)}{(3-2i)}$$

$$\frac{(3+2i)}{(3+2i)} =$$

↑
mult
by conjugate
numerator &
denom

$$\frac{6+4i+12i+8i^2}{9+6i-6i-4i^2}$$

$$= \frac{6+16i-8}{9+4}$$

$$= \frac{-2+16i}{13}$$

$$= -\frac{2}{13} + \frac{16}{13}i$$