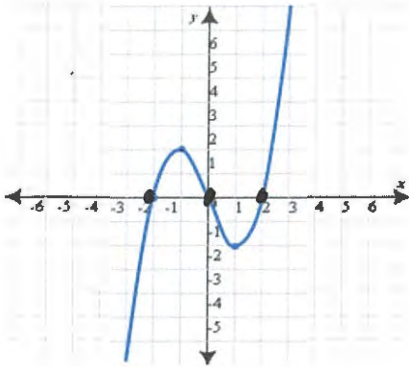


# Math 3 Fall Semester Final Review

~~DISPLAY~~  
MASTER

Use the following graph of  $f(x)$  to answer questions 1-4.



1. Identify the x-intercept(s) of the function.

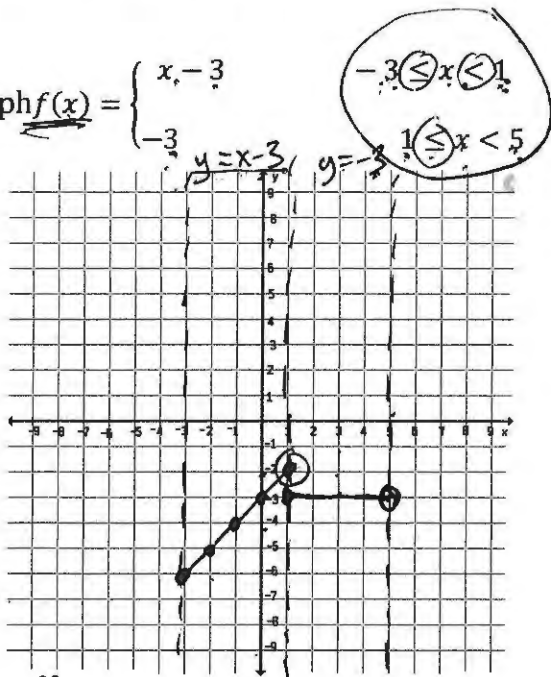
$(-2, 0) \quad (0, 0) \quad (2, 0)$

2. Determine the end behavior of the function:

a) As  $x \rightarrow -\infty, f(x) \rightarrow \infty$

b) As  $x \rightarrow \infty, f(x) \rightarrow -\infty$

3. Graph  $f(x) = \begin{cases} x-3 & -3 < x < 1 \\ -3 & 1 \leq x < 5 \end{cases}$



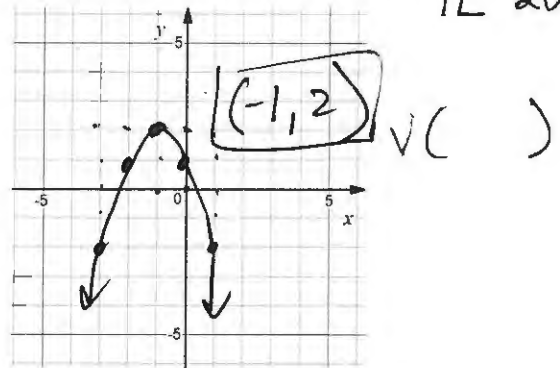
4. Without graphing, use the piecewise function to evaluate the  $f(3)$

$$f(x) = \begin{cases} -x+6 & -4 \leq x < 0 \\ 4x-1 & 1 \leq x < 6 \\ 7 & 6 \leq x < 8 \end{cases}$$

III

5. Graph  $f(x) = -(x+1)^2 + 2$

IL 2U



6.  $(5x^2 - 7x + 2) + (4x^2 + x + 5)$

$x^2 - 6x - 3$

7.  $(7x + 2)(2x^2 - 5x + 3)$

$14x^3 - 35x^2 + 21x + 6x^2 - 10x + 6$

$14x^3 - 31x^2 + 11x + 6$

8. Divide  $(x^5 + 2x^4 - 3x^3 + x - 1) \div (x - 2)$

$$\begin{array}{r} 2 \overline{) 1 \ 2 \ -3 \ 0 \ 1 \ -1} \\ \underline{2 \ 8 \ 10 \ 20 \ 42} \\ 4 \ 3 \ 5 \ 2 \ 10 \ 26 \ 41 \\ \underline{4 \ 8 \ 5 \ 2 \ 10 \ 26 \ 41} \\ 0 \end{array}$$

$x^4 + 4x^3 + 5x^2 + 10x + 21 \div x - 2$

9. Divide  $(6x^3 + 2x^2 - 11x + 12) \div (3x + 4)$

$2x^2 - 2x - 1 + \frac{16}{3x+4}$

10. If  $f(x) = x^2 - 5x + 1$ , find the value of  $f(-3)$ .

$(-3)^2 - 5(-3) + 1 = 9 + 15 + 1 = 25$

$$\begin{array}{r} -3 \overline{) 1 \ -5} \\ \underline{1 \ -8} \\ 24 \end{array}$$

### Math 3 Fall Semester Final Review

11. Find the factors of  $x^3 - 64$

$$(x-4)(x^2 + 4x + 16)$$

12. Find the x-intercepts of

$$f(x) = x^2 - 10x + 21$$

$$0 = x^2 - 10x + 21$$

$$0 = (x-7)(x-3)$$

$$\boxed{(7,0) (3,0)}$$

13. Find the factors of  $5x^2 - 11x - 12$

$$(5x+4)(x-3)$$

14. Find the x-intercepts of

$$f(x) = 5x^2 - 11x - 12$$

$$0 = 5x^2 - 11x - 12$$

$$0 = (5x+4)(x-3)$$

$$5x+4=0 \quad x=3$$

$$x = -4/5$$

$$\boxed{(3,0) (-4/5, 0)}$$

15. Find the x-intercepts of

$$f(x) = 4x^3 + 24x^2 + 32x$$

$$0 = 4x(x^2 + 6x + 8) \quad 4x=0$$

$$0 = 4x(x+4)(x+2)$$

$$\boxed{(0,0) (-4,0) (-2,0)}$$

16. Find the x-intercepts of  $f(x) = 3x^3 - 75x$

$$0 = 3x(x^2 - 25)$$

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

$$\boxed{(0,0) (5,0) (-5,0)}$$

17. Solve:  $x(x^2 - 13x - 48) = 0$

$$x(x-16)(x+3) = 0$$

$$x=0$$

$$x=16$$

$$x=-3$$

18. Given  $f(x) = x^3 + 3x^2 - 10x - 24$  has a factor of  $(x+2)$  find all of the factors.

$$\begin{array}{r|rrrr} -2 & 1 & 3 & -10 & -24 \\ & & -2 & -2 & 24 \\ \hline & 1 & 1 & -12 & 0 \end{array}$$

$$x^2 + x - 12$$

$$-3x \quad x^2 + x - 12$$

$$4x \quad \boxed{(x+4)(x-3)(x+2)}$$

19. Given the roots/zeros of the polynomial, write the function in standard form.

$$x = 0, 3, -2$$

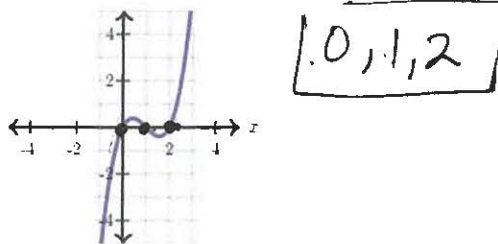
$$(x-0)(x-3)(x+2)$$

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

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

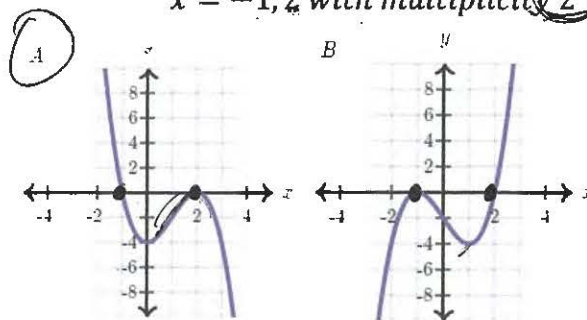
$$x(x^2 - x - 6)$$

20. Determine the zeros of the function:



21. Which of the following graphs could be a graph of a function with zeros of:

$$x = -1, 2 \text{ with multiplicity } 2$$



22. Determine the end behavior of the function

$$f(x) = -2x^5 + 13x^2 + x - 1$$

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow +\infty$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow -\infty$$

DID NOT COVER IN CLASS: #23-34

**Math 3 Fall Semester Final Review**

23. Find the domain of  $f(x) = \frac{x+7}{x^2+5x-14}$   
 $(x+7)(x-2)$

ARN except  $x = -7 + x = 2$

24. Simplify:  $\frac{2x^2+8x-24}{2x^2-8x+8} = \frac{2(x^2+4x-12)}{2(x^2-4x+4)}$

$\frac{(x+6)(x-2)}{(x-2)(x-2)}$

25. Simplify:  $\frac{x^2-16}{2x-6} \cdot \frac{6x-18}{x^2-9x+20}$

$\frac{(x+4)(x-4)}{2(x-3)} \cdot \frac{3(x-3)}{(x-4)(x-5)}$

$\frac{3(x+4)}{x-5}$

26. Simplify:  $\frac{5x}{x^2+2x} \div \frac{30x^2}{x+2}$

$\frac{5x}{x(x+2)} \cdot \frac{x+2}{30x^2} = \frac{1}{6x^2}$

27. Simplify:  $\frac{2x}{x+1} - \frac{3x-2}{x+1}$  → Distribute the minus!

$\frac{2x - (3x-2)}{x+1} = \frac{2x-3x+2}{x+1}$

$\frac{-x+2}{x+1}$

28. Simplify:  $\frac{x-11}{x^2+6x-40} + \frac{5}{x-4}$   
 $(x+10)(x-4)$

$\frac{x-11 + 5(x+10)}{(x+10)(x-4)} = \frac{x-11+5x+50}{(x+10)(x-4)} = \frac{6x+39}{(x+10)(x-4)}$

29. Solve for x. Check for extraneous solutions.

$\frac{4(x+2)}{1} \left( \frac{4x+2}{x} \right) \left( \frac{x^2-x}{x+2} \right) \frac{4(x+2)}{1}$  CD:  $4(x+2)$

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

$4x^2+2x+8x+4 = 4x^2-4x$

$4x^2+10x+4 = 4x^2-4x$

$14x = -4$

$x = -4/14 = \boxed{-2/7}$  ✓

OK in denominator

30. Solve for x. Check for extraneous solutions.

$\frac{1}{x} = \frac{9}{2x} - 6$  CD =  $2x$

$\frac{2x}{1} \left( \frac{1}{x} \right) = \frac{2x}{1} \left( \frac{9}{2x} \right) - \frac{2x}{1} (6)$

$2 = 9 - 12x$

$-7 = -12x$

$x = \frac{-7}{-12} = \boxed{\frac{7}{12}}$  ✓

OK in denominators

31. Solve for x. Check for extraneous solutions.

$\frac{2}{x-3} - \frac{1}{x} = 4$  CD =  $x(x-3)$

SKIP

$\frac{2}{x(x-3)} \cdot \frac{x(x-3)}{x-3} - \frac{x(x-3)}{1} \left( \frac{1}{x} \right) = \frac{x(x-3)}{1} (4)$

Distribute negative

$2x - (x-3) = 4x(x-3)$

$2x - x + 3 = 4x^2 - 12x$

$0 = 4x^2 - 13x + 3$

SKIP

32. Solve for x. Check for extraneous solutions.

$\frac{4}{x-2} + \frac{6}{x-4} = \frac{12}{x^2-6x+8}$  CD:  $(x-4)(x-2)$

$(x-4)(x-2)$

$\frac{4}{(x-2)} \cdot \frac{(x-4)(x-2)}{x-2} + \frac{6}{(x-4)} \cdot \frac{(x-4)(x-2)}{x-4} = \frac{(x-2)(x-4) \cdot 12}{(x-2)(x-4)}$

$4(x-4) + 6(x-2) = 12$

$4x-16 + 6x-12 = 12$

$10x-28 = 12$

$10x = 40$

$x = 4$

No solution

Not ok in denom.

### Math 3 Fall Semester Final Review

33. Solve for x. Check for extraneous solutions.

$$\frac{3}{x+3} + \frac{3x}{x+3} = 1$$

CD = x+3

$$\cancel{(x+3)} \cdot \left(\frac{3}{\cancel{x+3}}\right) + \cancel{(x+3)} \cdot \left(\frac{3x}{\cancel{x+3}}\right) = (x+3)(1)$$

$$3 + 3x = x + 3$$

$$2x = 0 \quad \text{ok in denom!}$$

$$x = 0 \quad \checkmark$$

34. Identify the vertical asymptote(s) of

$$f(x) = \frac{x^2 - 25}{x^2 + 8x - 20}$$

$$(x+10)(x-2)$$

$$x = -10 \quad x = 2$$

39. Solve  $x^2 - 20 = -84$

$$x^2 = -64$$

$$x = \pm \sqrt{-64}$$

$$x = \pm 8i$$

40. Solve.

$$x = \sqrt{13x - 30}$$

$$x^2 = 13x - 30$$

$$x^2 - 13x + 30 = 0$$

$$(x-3)(x-10) = 0$$

$$x = 3 \quad \checkmark$$

$$x = 10 \quad \checkmark$$

41. Solve.

$$\sqrt{x+2} + 4 = 1$$

$$\sqrt{9} + 4 = 1$$

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

$$x+2 = 9$$

$$x = 7$$

$$\text{no solution}$$

42. Solve.

$$(\sqrt{3x+1})^2 = (\sqrt{x+3})^2$$

$$\sqrt{4} = \sqrt{4}$$

35. Simplify the following:

$$x^5 \cdot x^7 (x^5)^7$$

$$x^5 \cdot x^7 \cdot x^{35}$$

$$x^{47}$$

$$2x^{-5} \frac{3x^7}{12x^5}$$

$$\frac{2x^{-5} \cdot 3x^7}{12x^5} = \frac{6x^2}{12x^5} = \frac{1}{2x^3}$$

36. Rewrite the following using a rational (fractional) exponent:

$$\sqrt[3]{x^5}$$

$$x^{5/3}$$

$$\sqrt{x^3}$$

$$x^{3/2}$$

$$\sqrt[5]{x}$$

$$x^{1/5}$$

$$(\sqrt[7]{x})^4$$

$$x^{4/7}$$

37. Rewrite the following in radical form:

$$x^{3/4}$$

$$\sqrt[4]{(x^3)^3}$$

$$x^{5/4}$$

$$\sqrt[4]{(x^5)^5}$$

$$x^{1/3}$$

$$\sqrt[3]{x}$$

$$x^{1/2}$$

$$\sqrt{x}$$

43. Solve.

$$5^3 = (\sqrt[3]{x-10})^3$$

$$5 = \sqrt[3]{x-10}$$

$$125 = x - 10$$

$$135 = x \quad \checkmark$$

38. Simplify  $64^{2/3}$

$$16$$