Practice Final Exam

Use the following graph of f(x) to answer questions 1-4.
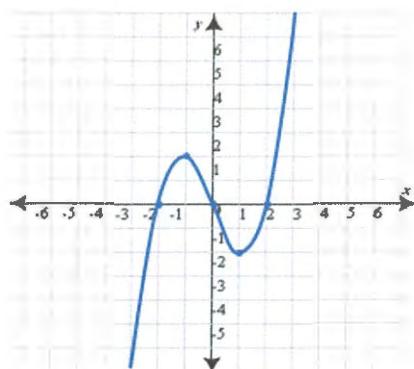
1. Determine the interval(s) over which the function is increasing.

$(-\infty, -1) + (1, \infty)$

2. Determine the interval(s) over which the function is decreasing.

$(-1, 1)$

3. Identify the positive interval(s).

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

4. Identify the negative interval(s): $(-\infty, -2)$ & $(0, 2)$

5. Domain: $(-\infty, \infty)$

6. Range: $(-\infty, \infty)$

7. Without graphing, use the piecewise function to evaluate the following:

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

a. $f(-3)$
$\boxed{9}$

b. $f(6)$
$\boxed{7}$

8. Graph $f(x) = (x-2)^2 - 3$

2R, 3D

$(+2, -3)$

(15)

MASTER

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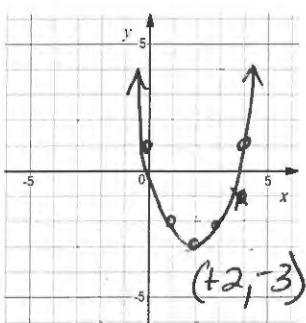
9. Graph $f(x) = \begin{cases} 2x+3 & -3 \le x < -1 \\ -3x-2 & -1 \le x < 1 \\ -5 & 1 \le x < 5 \end{cases}$

$y=2x+3$ $y=5$

$y=-3x-2$
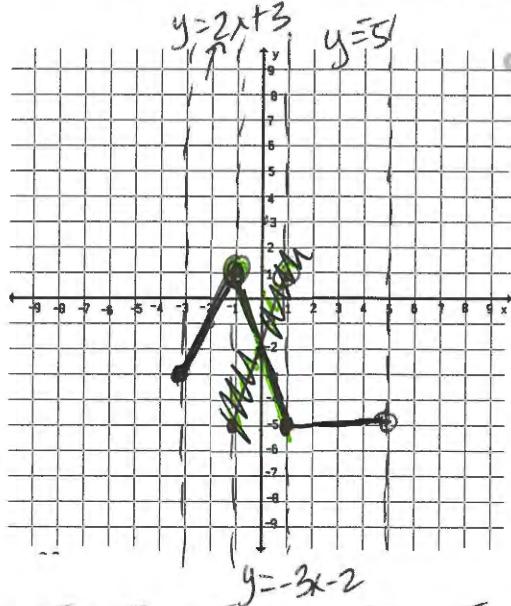
10. $(3x^3 + 5x^2 - 7x + 4) + (4x^2 - 11x + 5)$

$\boxed{3x^3 + 9x^2 - 18x + 9}$

11. $(3x^3 + 5x^2 - 7x + 4) - (4x^2 - 11x + 5)$

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

12. $(2x^2 + 5)(-3x^2 + 4x - 1)$

$-6x^4 + 8x^3 - 2x^2 - 15x^2 + 20x - 5$

$\boxed{-6x^4 + 8x^3 - 17x^2 + 20x - 5}$

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

$$\begin{array}{r|rrrrrr} -2 & 1 & 2 & -3 & 0 & 1 & -1 \\ & & -2 & 0 & 6 & -12 & 22 \\ \hline & 1 & 0 & -3 & 6 & -11 & 21 \end{array}$$

$\boxed{x^4 - 3x^2 + 6x - 11 + \dfrac{21}{x+2}}$

14. Divide $(6x^3 - 25x^2 + 2x + 8) \div (2x + 1)$

$\boxed{3x^2 - 14x + 8}$

$\begin{array}{r} 2x+1 \overline{\smash{\big)}\, 6x^3 - 25x^2 + 2x + 8} \\ \underline{-6x^3 + 3x^2} \\ -28x^2 + 2x \\ \underline{+28x^2 + 14x} \\ 16x + 8 \\ \underline{-16x + 8} \end{array}$

15. Find the factors of $8x^3 - 27$

$(2x-3)(4x^2+6x+9)$

16. Find the x-intercepts of

$$f(x) = x^2 - 10x + 21$$
$$0 = x^2 - 10x + 21$$
$$0 = (x-7)(x-3)$$
$$x = 7 \quad x = 3$$
$$(7,0) \quad (3,0)$$

17. Factor completely: $4x^3 + 24x^2 + 32x$

$4x(x^2+6x+8)$
$4x(x+4)(x+2)$

18. Given $f(x) = x^3 + 6x^2 + 3x - 10$ has a factor of $(x-1)$, find **all** of the factors.

$$1 \underline{| \; 1 \quad 6 \quad 3 \quad -10}$$
$$\quad\quad 1 \quad 7 \quad 10$$
$$\overline{1_{x^2} \; 7_x \; 10_c} \quad \text{Or}$$

Don't forget the factor that was given

$x^2 + 7x + 10$
$(x+5)(x+2)(x-1)$

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

$$x = -1, 1, 2$$
$$(x+1)(x-1)(x-2)$$
$$(x^2-1)(x-2)$$
$$x^3 - 2x^2 - x + 2$$

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

$x = -1, 2$ with multiplicity 2 — bounce back

A

B
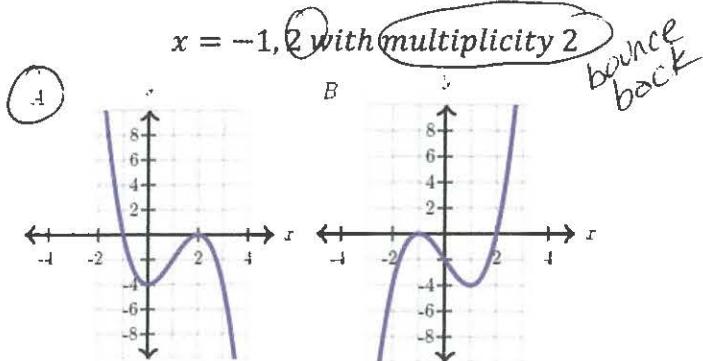
21. Determine the end behavior of the function

$$f(x) = 3x^4 - 12x + 2$$

As $x \to -\infty$, $f(x) \to \infty$

Right End Behavior $\to$ As $x \to \infty$, $f(x) \to \infty$

22. Simplify: $\dfrac{x^2-9}{x^2+3x-18}$

$\dfrac{(x+3)(x-3)}{(x+6)(x-3)}$

23. Simplify: $\dfrac{x^3+4x}{x+3} \cdot \dfrac{x^2-9}{x^3+x^2-12x}$

$$\dfrac{x(x^2+4)}{x+3} \cdot \dfrac{(x+3)(x-3)}{x(x+4)(x-3)}$$

$$\dfrac{x^2+4}{x+4}$$

24. Simplify: $\dfrac{4x^2-12x}{x^2+2x-15} \div \dfrac{5x^2-15x}{4x+20}$

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

$$\dfrac{16}{5(x-3)}$$

25. Simplify: $\dfrac{4}{x-3} - \dfrac{6}{x^2-9}$

CD: $(x+3)(x-3)$

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

$$\dfrac{4(x+3)-6}{(x+3)(x-3)}$$

$$\dfrac{4x+12-6}{(x+3)(x-3)} = \dfrac{4x+6}{(x+3)(x-3)}$$

(11)
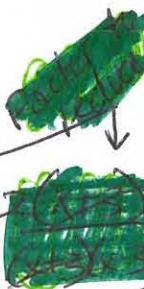
26. Simplify: $\dfrac{x-11}{x^2+6x-40}+\dfrac{5}{x-4}$

$(x+10)(x-4)$

$\dfrac{x-11+5(x+10)}{(x+10)(x-4)}$

$\dfrac{x-11+5x+50}{}$

$\boxed{\dfrac{6x+39}{(x+10)(x-4)}}$

27. Solve for x. Check for extraneous solutions.

$\dfrac{18}{x^2-9}=\dfrac{x}{x-3}+\dfrac{2x}{x+3}$

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

$\boxed{\begin{array}{l}x=3\\x=-2\end{array}}$

$18=x(x+3)+2x(x-3)$

$18=x^2+3x+2x^2-6x$

$0=3x^2-3x-18$

$0=3(x^2-x-6)$

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

28. Solve for x. Check for extraneous solutions.

$\dfrac{3x+2}{5}-\dfrac{2x+5}{3}=\dfrac{2}{15}$

$3(3x+2)-(10x+25)=2$

$9x+6-10x-25=2$

$-x-19=2$

$-x=21$

$\boxed{x=-21}$

29. Identify the vertical asymptote(s) of

$$f(x)=\dfrac{3}{(x+2)(x-6)}$$

$\boxed{\begin{array}{l}x=-2\\x=6\end{array}}$

30. Find the y-intercept(s) of $f(x)=\dfrac{x^2+5}{x^2-11}$

$y=\dfrac{-5}{11}$

$\boxed{\left(0,-\dfrac{5}{11}\right)}$

31. Rewrite the following in radical form:

$x^{\frac{3}{4}}$ $x^{\frac{5}{4}}$

$\boxed{\left(\sqrt[4]{x}\right)^3}$ $\boxed{\left(\sqrt[4]{x}\right)^5}$

32. Simplify $36^{\frac{3}{2}}$

$\boxed{216}$

33. Solve. Make sure to check for extraneous solutions!

$3\sqrt{3x+7}=15$

$\left(\sqrt{3x+7}\right)^2=(5)^2$

$3x+7=25$

$3x=18$

$\boxed{x=6}$

34. Factor: $2x^3+3x^2+4x+6$

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

$\boxed{(2x+3)(x^2+2)}$

35. Simplify: $(5x-1)(2x+3)$

$10x^2+15x-2x-3$

$\boxed{10x^2+13x-3}$

36. Simplify: $(6x-5)^2$

$\boxed{36x^2-60x+25}$

⑫

37. Find the domain of $f(x) = \frac{x+4}{x^2-5x+6}$ $= \frac{x+4}{(x-3)(x-2)}$

$x=3 \quad x=2$

ARN except ~~x=6,-1~~

38. Find the x-intercept(s) of $f(x) = \frac{x^2-9}{x^2-11}$ $\frac{(x+3)(x-3)}{}$

$x = 3, -3$ $\boxed{(3,0) (-3,0)}$

39. Find the horizontal asymptote of

$f(x) = \frac{x+4}{x^2-5x+6}$ $\boxed{y=0}$

40. Find the horizontal asymptote of

$f(x) = \frac{x^2-9}{x^2-11}$

$\boxed{y=1}$

41. Solve: $x^2 - 20 = -56$

$x^2 = -36$

$\boxed{x = \pm 6i}$

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