Chapter Practice 2.1-2.5 Test

Precalculus | Mr. Cooper

Name ______________________

Date ______________________

Period ______________________

Use long division to divide $f(x)$ by $d(x)$. Show all work. (or 25-28 in book review)

1. $f(x) = 2x^4 - 3x^3 + 14x + 7$; $d(x) = x^2 + 4$

$$\begin{array}{r} 2x^2 - 3x - 8 \\ x^2+0x+4 \overline{\big)\, 2x^4 - 3x^3 + 0x^2 + 14x + 7} \\ -\,(2x^4 + 0x^3 + 8x^2) \\ \hline -3x^3 - 8x^2 + 14x \\ +3x^3 + 0x^2 + 12x \\ \hline -8x^2 + 26x + 7 \\ +8x^2 + 0x + 32 \\ \hline 26x + 39 \end{array}$$

Place holder!

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$$= \boxed{2x^2 - 3x - 8 + \frac{26x+39}{x^2+4}}$$

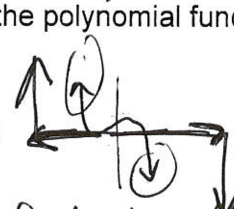
2. $f(x) = 3x^4 - 5x^3 - 2x^2 + 3x - 6$; $d(x) = 3x + 1$

$$\begin{array}{r} x^3 - 2x^2 + 1 \\ 3x+1 \overline{\big)\, 3x^4 - 5x^3 - 2x^2 + 3x - 6} \\ -\,(3x^4 + x^3) \\ \hline -6x^3 - 2x^2 \\ +6x^3 + 2x^2 \\ \hline 3x - 6 \\ -\,(3x + 1) \\ \hline -7 \end{array}$$

$$= \boxed{x^3 - 2x^2 + 1 + \frac{-7}{3x+1}}$$

Describe the end behavior of the polynomial function using $\lim\limits_{x\to-\infty} f(x)$ and $\lim\limits_{x\to\infty} f(x)$. Justify why you believe this to be true.

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



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

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

Cubic function has odd degree means opposite end behavior, $-a$ value indicates an overall decrease from left to right

4. $f(x) = x^4 - 5x^2 - 23x + 3$

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

$\lim\limits_{x\to\infty} f(x) = \infty$

even degree means end behavior is the same and $+a$ shows the function to increases at the ends.

Without graphing, tell me if this graph crosses the x $axis$, kisses the x $axis$, or both, justify why you believe so, tell me where these things might happen. (or 45-48 in book review)

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

- kisses the x-axis at $x=-7$ because it has even multiplicity
- crosses the x-axis at $x=5$ because of its odd multiplicity

How did I know to start at $x=4$? Good guess

Write a list of all potential rational zeros for the function listed below. Then determine all the zeros of the function. Show me the justification! (or 37 in book review)

6. $f(x) = 2x^4 - 7x^3 - 8x^2 + 14x + 8$

P.Z. $= \pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{2}$

$$\begin{array}{r|rrrrr} 4 & 2 & -7 & -8 & 14 & 8 \\ & & 8 & 4 & -16 & -8 \\ \hline -\frac{1}{2} & 2 & 1 & -4 & -2 & 0 \\ & & -1 & 0 & 2 & \\ \hline & 2 & 0 & -4 & 0 & \end{array}$$

$(x-4)(x+\frac{1}{2})(2x^2-4)=0$

$2x^2-4=0$

$2x^2=4$

$\sqrt{x^2}=\sqrt{2}$

$x=\pm\sqrt{2}$

$\boxed{x=4, -\frac{1}{2}, \sqrt{2}, -\sqrt{2}}$

for the second division make sure to use "new" numbers as dividend! don't go back to the originals or you won't reduce the overall function to a(quadratic)(linear)(linear)

7. $f(x) = 2x^5 - 5x^4 + x^3 + x^2 - x + 6$ P.Z. $= \pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$

$$\begin{array}{r|rrrrrr} 2 & 2 & -5 & 1 & 1 & -1 & 6 \\ & & 4 & -2 & -2 & -2 & -6 \\ \hline -1 & 2 & -1 & -1 & -1 & -3 & 0 \\ & & -2 & 3 & -2 & 3 & \\ \hline \frac{3}{2} & 2 & -3 & 2 & -3 & 0 & \\ & \downarrow & 3 & 0 & 3 & & \\ \hline & 2 & 0 & 2 & 0 & & \end{array}$$

$(x-2)(x+1)(x-\frac{3}{2})(2x^2+2)=0$

$2x^2+2=0$

$2x^2=-2$

$\sqrt{x^2}=\sqrt{-1}$

$x=\pm i$

$\boxed{x=2, -1, \frac{3}{2}, i, -i}$

Write a polynomial function of minimum degree in standard form with real coefficients and the zeros listed… (or 64-66 in book review)

8. 2, 4, -3

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

$(x^2-6x+8)(x+3)=y$

x^3-6x^2+8x

$3x^2-18x+24$

$\boxed{x^3-3x^2-10x+24=y}$

9. $2, and\ 1+i$ and $1-i$ remember, complex imaginaries always come in pairs.

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

$x^2 - x + \cancel{ix}$

$-x \quad + 1 \cancel{-i}$

$\cancel{-ix} \quad \cancel{+i} \quad -i^2 + 1$

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

x^3-2x^2+2x

$-2x^2+4x-4$

$\boxed{x^3-4x^2+6x-4=y}$

Determine the type of function, the end behavior (don't forget the limit notation), y-intercept, and zeros of the function below. **JUSTIFY EACH ITEM**. Feel free to list anything else you know about this function with appropriate justification. (or 53-56 in book review)

10. $f(x) = x^4 - 3x^3 - 6x^2 + 6x + 8$

- Quartic Function (it's 4th degree)
- $\lim\limits_{x \to -\infty} f(x) = \infty$ (even degree, positive leading coefficient)
  $\lim\limits_{x \to \infty} f(x) = \infty$
- y-int $(0,8)$ P.Z. $= \pm 1, \pm 2, \pm 4, \pm 8$
- x-int

$$\begin{array}{r|rrrrr} 4 & 1 & -3 & -6 & 6 & 8 \\ & & 4 & +4 & -8 & -8 \\ \hline -1 & 1 & +1 & -2 & -2 & 0 \\ & \downarrow & -1 & 0 & 2 & \\ \hline & 1 & 0 & -2 & 0 & \end{array}$$

$(x-4)(x+1)(x^2-2) = 0$

$x^2 - 2 = 0$

$\sqrt{x^2} = \sqrt{2}$

$x = \pm\sqrt{2}$

$\boxed{x = 4, -1, \sqrt{2}, -\sqrt{2}}$

11. $f(x) = x^3 - 2x^2 - 7x - 4$

- cubic function (3rd degree)
- $\lim\limits_{x \to -\infty} f(x) = -\infty$ (odd degree, positive leading coefficient)
  $\lim\limits_{x \to \infty} f(x) = \infty$
- y-int $(0,-4)$
- x-int ~~1 2 4 2 4~~

P.Z. $= \pm 1, \pm 2, \pm 4$

$$\begin{array}{r|rrrr} 4 & 1 & -2 & -7 & -4 \\ & & 4 & 8 & 4 \\ \hline & 1 & 2 & 1 & 0 \end{array}$$

$(x-4)(x^2+2x+1) = 0$

$x = \dfrac{-2 \pm \sqrt{4 - 4(1)(1)}}{2}$

$x = \dfrac{-2 \pm \sqrt{0}}{2}$

$x = -1$

$\boxed{\begin{array}{l} x = 4 \\ x = -1 \text{ w/ multiplicity } 2 \end{array}}$