10/30/14

Midt

d.

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(10pts)

95

1. Factor each of the following polynomials into linear terms with integer coefficients:

$$h(x) = 2x^3 - 3x^2 - 8x - 3$$

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

10

$h(x) = 2x^3 - 3x^2 - 8x - 3$

$h(1) = 2 \quad -3 \quad -8 \quad -3$ X

$h(-1) = -2 \quad -3 \quad 8 \quad -3$ $(x+1)$

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

$\boxed{(x+1)(x-3)(x+\tfrac{1}{2})}$

$x = \dfrac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$

$\dfrac{5 \pm \sqrt{25+24}}{4} = \dfrac{5 \pm \sqrt{49}}{4}$

$\dfrac{5+7}{4}$ OR $\dfrac{5-7}{4}$

$\dfrac{12}{4}$ OR $\dfrac{-2}{4}$

$x = 3$ or $x = -\frac{1}{2}$

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

$g(1) = 1 \quad 3 \quad -1 \quad 3$ ✓ $(x-1)$

$(x-1)(x^2+4x+3)$

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

$g(x) = (x-1)(x+3)(x+1)$ ✓

$h(x) = (x+1)(x-3)(2x+1)$ ✓

(20pts)

Midterm 2

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2. Sketch a rough graph of the following rational function made from the functions in the previous problem. Clearly label any roots (R), y-intercept (YI), vertical asymptote(s) (VA); horizontal asymptote(s) (HA); Slant asymptote (SA); and/or holes (indicate with a hollow point).

$$f(x) = \frac{h(x)}{g(x)} \quad \frac{\cancel{(x+1)}(x-3)(2x+1)}{(x-1)(x+3)\cancel{(x+1)}}$$

hole @ x = -1

VA → x = 1, -3

HA → y = 2

20

$2x+1=0$

$2x=-1$

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

YI → $y = \frac{(0-3)(2(0)+1)}{(0-1)(0+3)} \quad \frac{(-3)(1)}{(-1)(3)} = 1$ (0,1) = YI

Roots: (3,0) $(\frac{-1}{2},0)$

$y = \frac{(-1-3)(2(-1)+1)}{(-1-1)(-1+3)} = \frac{(-4)(-1)}{(-2)(2)} \quad \frac{+4}{-4} = -1$ (-1,-1)

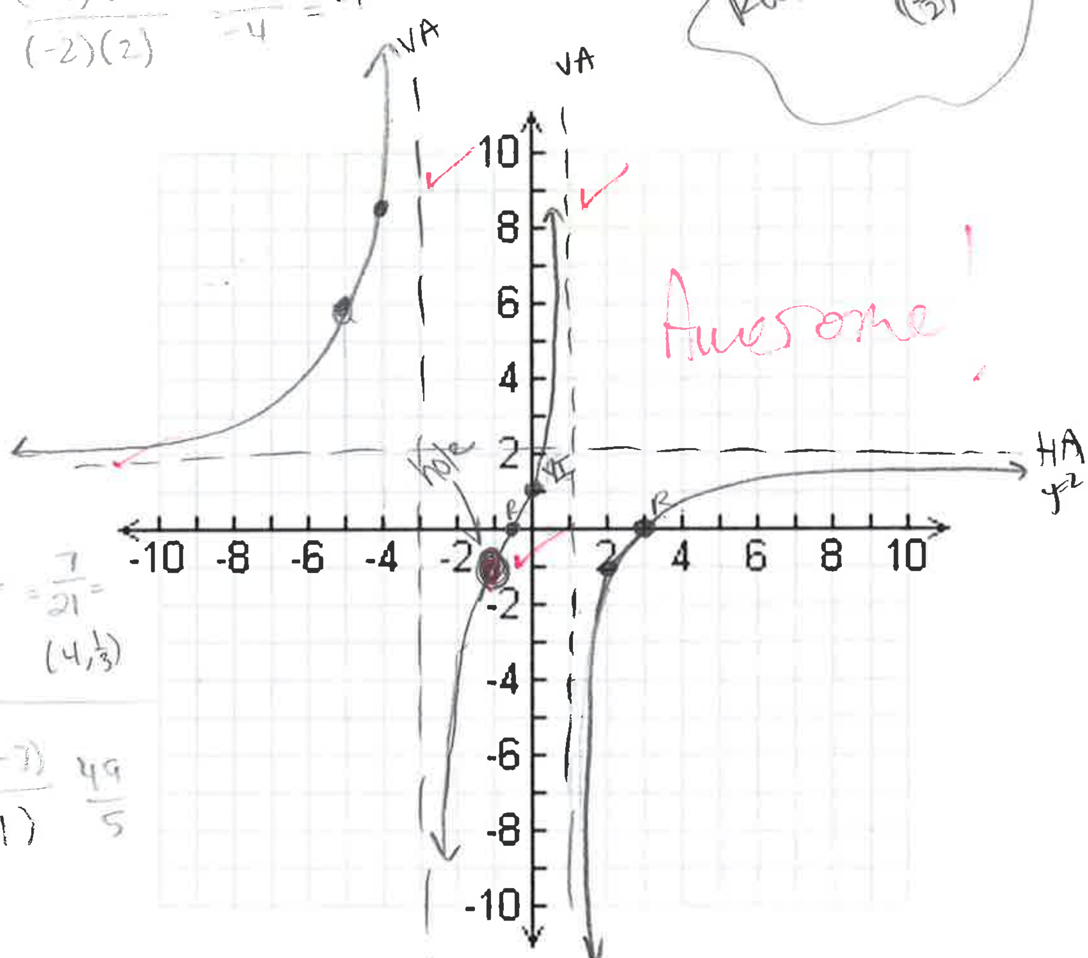
$\frac{(2-3)(2(2)+1)}{(2-1)(2+3)} = \frac{(-1)(5)}{(1)(5)} = -1$

$y = \frac{(4-3)(2(4)+1)}{(4-1)(4+3)} = \frac{1 \cdot 7}{3 \cdot 7} = \frac{7}{21} =$ (4, 1/3)

$\frac{(-4-3)(2(-4)+1)}{(-4-1)(-4+3)} \quad \frac{(-7)(-7)}{(-5)(-1)} \quad \frac{49}{5}$

(-4, 9.8)

$\frac{(-5-3)(2(-5)+1)}{(-5-1)(-5+3)} \quad \frac{(-8)(-9)}{(-6)(-2)} \quad \frac{72}{12} = 6$



Midterm 2

$\frac{13}{\frac{4}{52}}$

..nd the coefficient of the term containing only x^4 for the binomial expansion of:

$$\left(x^4 - \frac{1}{x^2}\right)^{13}$$

$\frac{20}{20}$

$(x^4)^a\left(-\frac{1}{x^2}\right)^b$

$a+b=13$

$4a-2b=4$

$$\left[\begin{array}{cc|c} 1 & 1 & 13 \\ 4 & -2 & 4 \end{array}\right] \xrightarrow{4R1-R2} \left[\begin{array}{cc|c} 1 & 1 & 13 \\ 0 & 6 & 48 \end{array}\right] \xrightarrow{\frac{R2}{6}} \left[\begin{array}{cc|c} 1 & 1 & 13 \\ 0 & 1 & 8 \end{array}\right] \xrightarrow{R1-R2} \left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & 8 \end{array}\right]$$

$$\begin{array}{c|c} \left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & 8 \end{array}\right] & \begin{array}{c} a \\ b \end{array} \end{array}$$

Love those matrices!

$C_8^{13}(x^4)^5\left(-\frac{1}{x^2}\right)^8$

$\frac{(-1)^8 x^{20}}{(-x)^{16}} = \frac{x^{20}}{x^{16}} = C_8^{13}x^4$

$1287x^4$

$\boxed{1287}$ ✓

$-x^{16} \neq (-x)^{16}$

$-1^8 = -1$

$(-1)^8 = 1$

Careful!

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Midterm 2

(20pts)

4. Find a polynomial $m(x)$, with integer coefficients that has $x = -2 + \sqrt[4]{2}$ and $x = 2$ as roots, and a leading coefficient of 3. The final answer must be in 'expanded form,' (not factored).

$X=2$

$(x-2)$

$X = -2 + \sqrt[4]{2}$

$(x+2)^4 = (\sqrt[4]{2})^4$

$x^4+8x^3+24x^2+32x+16 = 2$

$(x-2)$ $x^4+8x^3+24x^2+32x+14=0$

1 8 (24) (32) (14)

1 (−2)

(−2) (−16) (−48) (−64) (−28)

1 8 (24) (32) 14

1 6 8 (−16) (−50) (−28)

$3(x^5+6x^4+8x^3-16x^2-50x-28)$

$3x^5+18x^4+24x^3-48x^2-150x-84$

20

$m(x) =$

Midterm 2

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(15pts)

5. Solve the radical equation: $\sqrt{4x-3}+2x-1=0$

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

$4x^2-2x-2x+1$

$4x^2-4x+1$

15

$\sqrt{4x-3}+2x-1=0$

$\quad -2x+1 \quad -2x+1$

$(\sqrt{4x-3})^2=(2x+1)^2$

$4x-3=4x^2-4x+1$

$-4x+3 \qquad -4x+3$

$0=4x^2-8x+4$

$\quad 4$

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

$0=(x-1)(x-1)$

$0=(x-1)^2$

$x-1=0$

$x=1$

Check:

$\sqrt{4(1)-3}+2(1)-1\overset{?}{=}0$

$1+2-1\overset{?}{=}0$

$2\neq 0$

$\boxed{\text{NO Solution}}$

(15pts)

6. Find the inverse of the function $y=2^{3x-2}+5$

10

$x=2^{3y-2}+5$

$x-5=2^{3y-2}$

$\log_2 x-\log_2 5=\log_2 2^{3y-2}$

$\log_2 \frac{x}{5}=3y-2$

$\log_2 \frac{x}{5}+2=3y$

$\boxed{y=\frac{\log_2 \frac{x}{5}+2}{3}}$

$(x-5)$

$\log_2(x-5)\neq\log_2 x-\log_2 5$

-5