

Math 3 Midterm Review

$$\textcircled{1} \begin{cases} y = -1/4x - 2 \\ y = -5/4x + 2 \end{cases}$$

Graph in calc
2nd, trace, intersect $(4, -3)$

$$\textcircled{2} \begin{cases} x + 4y = -2 \rightarrow x = -2 - 4y \\ -2x - 2y = 10 \end{cases}$$

$$\begin{aligned} -2(-2 - 4y) - 2y &= 10 \\ 4 + 8y - 2y &= 10 \\ 6y &= 6 \\ y &= 1 \end{aligned}$$

$x = -2 - 4(1)$
 $x = -6$

$(-6, 1)$

$$\textcircled{3} \begin{cases} 3x + 6y + 3z = 15 \text{ elim } z \\ 6x + 2y - 6z = 10 \\ -4x + 6y + 6z = 8 \end{cases}$$

$$\begin{aligned} \textcircled{1} & \begin{cases} 3x + 6y + 3z = 15 \text{ (mult. } 2) \\ 6x + 2y - 6z = 10 \end{cases} \\ \textcircled{2} & \begin{cases} 6x + 12y + 6z = 30 \\ 6x + 2y - 6z = 10 \\ \hline 12x + 14y = 40 \end{cases} \end{aligned}$$

$$\begin{aligned} \textcircled{2} & \begin{cases} 6x + 2y - 6z = 10 \\ -4x + 6y + 6z = 8 \end{cases} \\ \textcircled{3} & \begin{cases} 6x + 2y - 6z = 10 \\ -4x + 6y + 6z = 8 \\ \hline 2x + 8y = 18 \end{cases} \end{aligned}$$

$$\begin{aligned} \star & \begin{cases} 12x + 14y = 40 \\ 2x + 8y = 18 \text{ (mult. } -6) \end{cases} \\ \star & \begin{cases} 12x + 14y = 40 \\ -12x - 48y = -108 \\ \hline -34y = -68 \\ y = 2 \end{cases} \end{aligned}$$

$$\begin{aligned} \star 12x + 14(2) &= 40 \\ 12x + 28 &= 40 \\ 12x &= 12 \\ x &= 1 \end{aligned}$$

$(1, 2, 0)$

$$\begin{aligned} \textcircled{1} & 3(1) + 6(2) + 3z = 15 \\ 3 + 12 + 3z &= 15 \\ 15 + 3z &= 15 \\ 3z &= 0 \\ z &= 0 \end{aligned}$$

$$\textcircled{4} \begin{cases} 6x + 3y - 5z = -26 \\ -4x + z = 25 \\ 4x + 6y - 5z = 1 \end{cases} \text{ elim } y$$

$$\star \textcircled{2} -4x + z = 25$$

$$\begin{aligned} \textcircled{1} & \begin{cases} 6x + 3y - 5z = -26 \text{ (mult. } -2) \\ 4x + 6y - 5z = 1 \end{cases} \\ \textcircled{3} & \begin{cases} -12x - 6y + 10z = 52 \\ 4x + 6y - 5z = 1 \\ \hline -8x + 5z = 53 \end{cases} \end{aligned}$$

$$\begin{aligned} \star & \begin{cases} -4x + z = 25 \\ -8x + 5z = 53 \end{cases} \\ & -8x + 5(4x + 25) = 53 \\ & -8x + 20x + 125 = 53 \\ & 12x = -72 \\ & x = -6 \end{aligned}$$

$$\begin{aligned} \textcircled{1} & 6(-6) + 3y - 5(1) = -26 \\ -36 + 3y - 5 &= -26 \\ -41 + 3y &= -26 \\ 3y &= 15 \\ y &= 5 \end{aligned}$$

$$\begin{aligned} z &= 4(-6) + 25 \\ z &= 1 \end{aligned}$$

$(-6, 5, 1)$

$$\textcircled{5} (3p^4 + 4 + 3p) - (6p^2 + 5 - p)$$

$$3p^4 + 4 + 3p - 6p^2 - 5 + p$$

$$3p^4 - 6p^2 + 4p - 1$$

$$\textcircled{6} (7p+4)(6p-1)$$

$$42p^2 - 7p + 24p - 4$$

$$42p^2 + 17p - 4$$

$$\textcircled{7} (a^3 - a^2 - 30a - 49) \div (a+4)$$

$$\begin{array}{r} -4 \overline{) 1 \quad -1 \quad -30 \quad -49} \\ +4 \quad -4 \quad 20 \quad 40 \\ \hline 1 \quad -5 \quad -10 \quad -9 \end{array}$$

$$a^2 - 5a - 10 - \frac{9}{a+4}$$

$$\textcircled{8} (12n^3 - 11n^2 - 2n + 11) \div (3n+1)$$

$$\begin{array}{r} 4n^2 - 5n + 1 \\ 3n+1 \overline{) 12n^3 - 11n^2 - 2n + 11} \\ - 12n^3 + 4n^2 \\ \hline -15n^2 - 2n \end{array}$$

$$\begin{array}{r} +15n^2 + 5n \\ \hline 3n + 11 \\ -3n + 1 \\ \hline 10 \end{array}$$

$$4n^2 - 5n + 1 + \frac{10}{3n+1}$$

$$\textcircled{9} f(x) = -4x^4 - 24x^3 + 4x^2 + 27x + 19 \text{ at } x = -6$$

$$\begin{array}{r} -6 \overline{) -4 \quad -24 \quad 4 \quad 27 \quad 19} \\ + \quad -4 \quad 24 \quad 0 \quad -24 \quad -18 \\ \hline -4 \quad 0 \quad 4 \quad 3 \quad 1 \end{array}$$

Remainder!

$$\textcircled{10} y = x^4 - 25x^2$$

GCF $x^2(x^2 - 25)$

perfect squares

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

$$\textcircled{11} y = x^3 + 7x^2 + 10x$$

GCF $x(x^2 + 7x + 10)$

$$x(x+5)(x+2)$$

$$\textcircled{12} (3v^3 + v^2) \div (3v-1)$$

$$v^2(3v+1) + (-1)(3v+1)$$

$$(3v+1)(v^2-1)$$

$$\textcircled{13} (40n^3 + 25n^2) \div (8n+5)$$

$$5n^2(8n+5) + 4(8n+5)$$

$$(8n+5)(5n^2+4)$$

$$\textcircled{14} 1+n^2$$

PRIME!

$$\textcircled{15} n^2 + 10n + 25$$

$$(n+5)(n+5)$$

$$\textcircled{16} (-2+3i) - (-1+5i)$$

$$-2+3i+1-5i$$

$$-1-2i$$

$$\textcircled{17} (-4+3i) + (5i) + (2i)$$

$$-4+10i$$

18) $n^2 - 4n - 38 = -6$
 $n^2 - 4n - 32 = 0$
 $(n-8)(n+4) = 0$
 $n=8 \quad n=-4$

19) $x^2 - 2x - 26 = -2$
 $x^2 - 2x - 24 = 0$
 $(x-6)(x+4) = 0$
 $x=6 \quad x=-4$

20) $n^2 - 7 = -6n$
 $n^2 + 6n - 7 = 0$
 $(n+7)(n-1) = 0$
 $n=-7 \quad n=1$

21) $p^2 - 3p = 10$
 $p^2 - 3p - 10 = 0$
 $(p-5)(p+2) = 0$
 $p=5 \quad p=-2$

22) $5n^2 - 2 = -30$
 $5n^2 + 28 = 0$
 $x = \frac{0 \pm \sqrt{0^2 - 4(5)(28)}}{2(5)}$

23) $2b^2 + 10 = 108$
 $2b^2 = 98$
 $b^2 = 49$
 $b = \pm 7$

$x = \frac{\pm \sqrt{-560}}{10}$

$x = \frac{\pm 4i\sqrt{35}}{10}$ *reduce!*

$x = \frac{\pm 2i\sqrt{35}}{5}$

25) $f(x) = 5x^3 - 19x^2 - 29x - 5$
 calc table: $(-1, 0)$
 $(5, 0)$

24) $f(x) = 5x^4 + 3x^2 - 8$
 calc table: $(-1, 0)$
 $(1, 0)$

$-1 \mid 5 \quad 0 \quad 3 \quad 0 \quad -8$
 $+\downarrow \quad -5 \quad 5 \quad -8 \quad 8$
 $\hline 5 \quad -5 \quad 8 \quad -8 \quad 0$

$1 \mid 5 \quad -5 \quad 8 \quad -8$
 $+\downarrow \quad 5 \quad 0 \quad -8$
 $\hline 5 \quad 0 \quad 8 \quad 0$ pem.

$5x^2 + 8 = 0$

$5x^2 = -8$

$x^2 = -8/5$

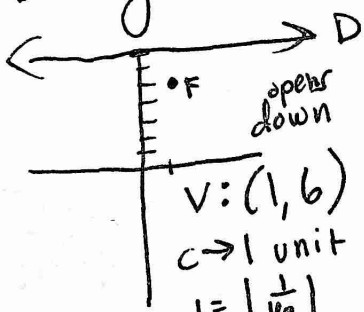
$x = \pm \sqrt{-8/5}$

$x = \pm \frac{\sqrt{8}}{\sqrt{5}}$

$x = \pm \frac{\sqrt{40}}{5}$ *now simplify the*

$x = \pm \frac{2i\sqrt{10}}{5}$

26) $F(1, 5)$
 Dir $y = 7$



$4a = 1$
 $a = 1/4$ *make it negative b/c it opens down*

$y = -\frac{1}{4}(x-1)^2 + 6$

$-1 \mid 5 \quad -19 \quad -29 \quad -5$
 $+\downarrow \quad -5 \quad 24 \quad 5$
 $\hline 5 \quad -24 \quad -5 \quad 0$

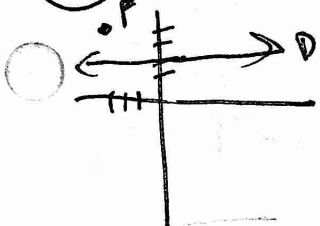
$5 \mid 5 \quad -24 \quad -5$
 $+\downarrow \quad 25 \quad 5$
 $\hline 5 \quad 1 \quad 0$ pem

$5x + 1 = 0$
 $5x = -1$
 $x = -1/5$

Roots: $x = -1, 5, -1/5$

roots: $x = +1 + 2i\sqrt{10}$

(27) $F(-3, 4)$ Dir $y=2$



$V: (-3, 3)$
 $c \rightarrow 1$ unit
 $1 = |1/4a|$
 $4a = 1$
 $a = 1/4 \rightarrow$ keep it positive b/c it opens up

$y = \frac{1}{4}(x+3)^2 + 3$

(29) $\frac{x}{9} + \frac{x}{12} = 1$ CD: 36

$\frac{4x}{36} + \frac{3x}{36} = \frac{36}{36}$
 $7x = 36$

$x = 5.14$ hours

(30) $\frac{4.44}{8} + \frac{4.44}{x} = 1$ CD: 8x

$\frac{4.44x}{8x} + \frac{35.52}{8x} = \frac{8x}{8x}$

$4.44x + 35.52 = 8x$
 $35.52 = 3.56x$
 $x = 9.98$ hours

(34) $\frac{r^2 - 11r + 28}{4r^2 + r - r^2} \cdot \frac{2-r}{r-2}$

$\frac{(r-7)(r-4)}{-1(r^2 - r - 4r^2)} \cdot \frac{-1(r-2)}{(r-2)}$

$\frac{(r-7)(r-4)}{r(r-7)(r+6)} \cdot 1$
 $\frac{r-4}{r+6}$

(28) A $\begin{cases} 7v + 9b = 393 \text{ (mult. } -2) \\ 14v + 4b = 338 \end{cases}$

$\begin{cases} 14v + 4b = 338 \\ -14v - 18b = -786 \end{cases}$
 $+ \quad 14v + 4b = 338$

$-14b = -448$

$b = 32$

$7v + 9(32) = 393$

$7v + 288 = 393$

$7v = 105$

$v = 15$

32 buses
15 vans

(31) $\frac{\sqrt{10}}{\sqrt{5}} = \frac{\sqrt{50}}{5}$ break down numerator

$\frac{5\sqrt{2}}{5}$ reduce! $\sqrt{2}$

(32) $\frac{3 + \sqrt{5}}{\sqrt{11}}$

$\frac{3\sqrt{11} + \sqrt{55}}{11}$

(33) $\frac{6-x}{x^2 - 3x - 18} = \frac{-1(x-6)}{(x-6)(x+3)}$

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

(35) $\frac{x+3}{7} \div \frac{9x^3 + 27x^2}{9x^3 + 63x^2}$

$\frac{x+3}{7} \cdot \frac{9x^2(x+7)}{9x^2(x+3)}$

$\frac{x+7}{7}$

(36) $\frac{x+3}{2} \div \frac{4}{x+3} \cdot \frac{2(x+3)}{1}$

$\frac{2(x+3)}{1} \cdot \frac{4}{1}$

CD: $2(x+3)$

$\frac{(x+3)(x+3) + 8}{8(x+3)}$

$\frac{x^2 + 6x + 9 + 8}{8x + 24}$

$\frac{x^2 + 6x + 17}{8x + 24}$

$$\textcircled{37} \frac{2r-4}{3r^2} = \frac{1}{2r} + \frac{1}{6r^2} \quad \underline{\text{CD}}: 6r^2$$

$$\frac{2(2r-4)}{6r^2} = \frac{3r}{6r^2} + \frac{1}{6r^2}$$

$$4r-8 = 3r+1$$

$$r = 9$$

$$\textcircled{39} 1 + \frac{3}{r} = \frac{r^2 - 5r + 4}{r^2} \quad \underline{\text{CD}}: r^2$$

$$\frac{r^2}{r} + \frac{3r}{r} = \frac{r^2 - 5r + 4}{r^2}$$

$$r + 3r = r^2 - 5r + 4$$

$$3r = -5r + 4$$

$$8r = 4$$

$$r = 1/2$$

$$\textcircled{41} f(x) = \frac{x^2 - 4}{-3x^2 + 6x + 24}$$

$$f(x) = \frac{(x-2)(x+2)}{-3(x^2 - 2x - 8)} \quad \frac{(x-2)(x+2)}{-3(x-4)(x+2)}$$

$$\text{VA: } \underline{x=4}$$

$$\text{HA: } \underline{y = -1/3}$$

$$\text{hole: } \underline{x = -2}$$

$$\textcircled{38} \frac{1}{3x+2} - \frac{x+2}{3x^2+2x} = \frac{x+3}{3x^2+2x} \quad \underline{\text{CD}}: x(3x+2)$$

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

$$x - x - 2 = x + 3$$

$$-2 = x + 3$$

$$-5 = x$$

$$\textcircled{40} f(x) = \frac{1}{3x^2+3x-6} - \frac{1}{3(x^2+x-2)} - \frac{1}{3(x+2)(x-1)}$$

$$\text{VA: } \underline{x = -2, x = 1}$$

$$\text{HA: } \underline{y = 0}$$

$$\text{hole: } \underline{\text{none}}$$

$$\textcircled{42} f(x) = \frac{x^3 + 2x^2 - 8x}{3x^3 - 27x}$$

$$f(x) = \frac{x(x^2 + 2x - 8)}{3x(x^2 - 9)}$$

$$f(x) = \frac{x(x+4)(x-2)}{3x(x+3)(x-3)}$$

$$\text{VA: } \underline{x = -3, x = 3}$$

$$\text{HA: } \underline{y = 1/3}$$

$$\text{hole: } \underline{x = 0}$$