# Key

Midterm Review 

## Gridded Response

(1) $x^3-1 \div x+2$

$x^3-1 \Rightarrow 1x^3+0x^2+0x^1-1$

$x+2=0$
$\;\;-2\;\;-2$
$x=-2$

$$\begin{array}{r|rrrr} -2 & 1 & 0 & 0 & -1 \\ & \downarrow & -2 & 4 & -8 \\ \hline & 1 & -2 & 4 & \boxed{-9} \end{array}$$

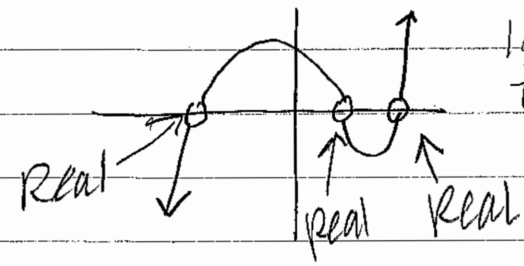
**The remainder is −9.**

(2) $f(x)=2x^5-13x^4+22x^3-187x^2-160x+336$

given factors: $(x-7)$ and $(x+4i)$

other known factor(s): $(x-4i)$ because imaginary always come in pairs.

So that is 3 so far. The other 2 are both real or both imaginary. The graph indicates the other two are real



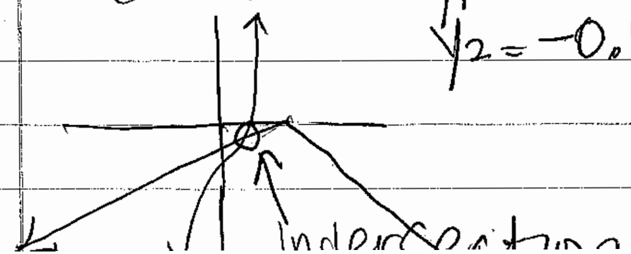

$\boxed{\text{3 Real Zeros}}$ & 2 imaginary

(3) $f(x)=2x^3+2x-3$ Find y-value when

$g(x)=-0.5|x-4|$ $f(x)=g(x)$

In calculator: $y_1=2x^3+2x-3$

$y_2=-0.5\,\text{abs}(x-4)$




$\boxed{y=-1.75}$

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Gridded Response

4. $h(x) = \begin{cases} -\frac{1}{2}x - 15 & \text{for } x \le -4 \\ 20 - 3x^2 & \text{for } x > -4 \end{cases}$

What is $h(-4) + 3h(-2)$?

$h(-4) = -\frac{1}{2}(-4) - 15$
$= 2 - 15$
$= -13$

$h(-2) = 20 - 3(-2)^2$
$= 20 - 3(4)$
$= 20 - 12$
$= 8$

$3h(-2) = 3(8) = 24$

$h(-4) + 3h(-2)$
$\downarrow \quad + \quad \downarrow$
$-13 \qquad 24 \quad = \boxed{11}$

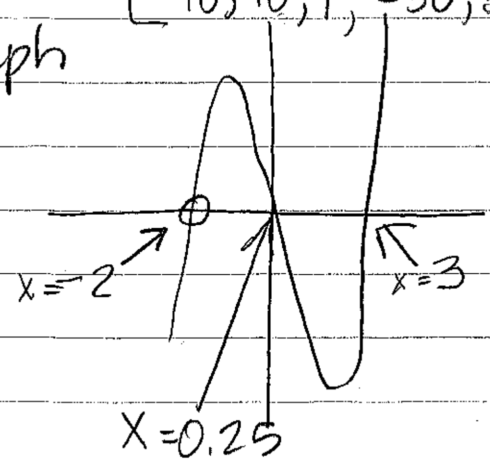
5. $H(x) = 4x^3 - 5x^2 - 23x + 6$

How far apart are the two closest zeros?

In calc:

$y_1 = 4x^3 - 5x^2 - 23x + 6$
$[-10, 10, 1, -30, 30, 5]$

Graph




From -2 to 0.25 is $\boxed{2.25 \text{ units}}$

Midterm Review Key 

Multiple Choice

(7) $m(x) = x^3 + 3x^2 - 2x - 4$

one zero is at $-1$. I can divide to find more.

$$\begin{array}{r|rrrr} -1 & 1 & 3 & -2 & -4 \\ & \downarrow & -1 & -2 & 4 \\ \hline & 1 & 2 & -4 & 0 \end{array}$$

The result is $1x^2 + 2x - 4$. This is not factorable so I know the answers are not pretty.

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 1$
$b = 2$
$c = -4$

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

$$x = \frac{-2 \pm \sqrt{4 + 16}}{2}$$

$$\sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5} = 2\sqrt{5}$$

$$x = \frac{-2 \pm \sqrt{20}}{2}$$

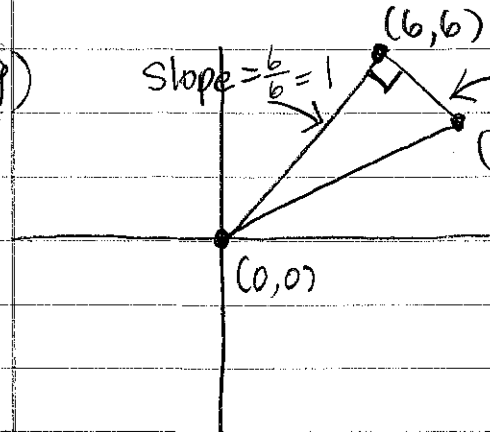
$$x = \frac{-2 \pm 2\sqrt{5}}{2} \quad \text{Reduce}$$

$$x = -1 \pm \sqrt{5}$$

$\boxed{C}$

(8) $\boxed{C}$

(9)




$\text{Slope} = \frac{6-3}{6-9} = \frac{3}{-3} = -1$

These are perpendicular

distance from $(6,6)$ to $(9,3)$

$$d = \sqrt{(9-6)^2 + (3-6)^2}$$
$$= \sqrt{(3)^2 + (-3)^2}$$
$$= \sqrt{9 + 9}$$

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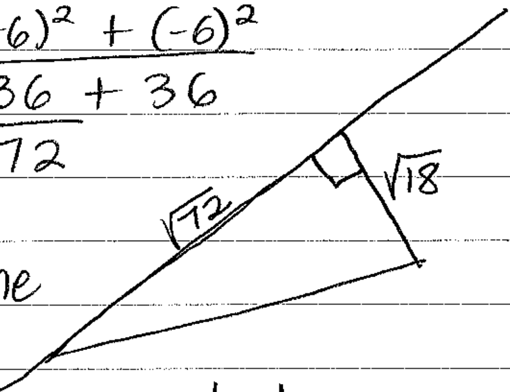
(9) Continued distance from (0,0) to (6,6)

$d = \sqrt{(0-6)^2 + (0-6)^2}$

$d = \sqrt{(-6)^2 + (-6)^2}$

$d = \sqrt{36 + 36}$

$d = \sqrt{72}$




$\sqrt{18}$ = radius of cone created

$\sqrt{72}$ = height of cone created

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi(\sqrt{18})^2(\sqrt{72})$

$V = \frac{1}{3}\pi(18)(\sqrt{72})$

$V = 6\pi(\sqrt{72})$

$\sqrt{72} = \sqrt{36 \cdot 2}$

$= \sqrt{36} \cdot \sqrt{2}$

$= 6\sqrt{2}$

$V = 6\pi(6\sqrt{2})$

$V = 36\pi\sqrt{2}$ units$^3$

$\boxed{C}$

(10) $48x^3 - 243xy^2$

$3x(16x^2 - 81y^2)$ GCF: 3X

Difference of 2 squares

$(4x)^2 \quad (9y)^2$

$3x(4x+9y)(4x-9y)$

$\boxed{D}$

(11) Build factors then multiply

$x = -1 \rightarrow (x - -1) \rightarrow (x+1)$ mult 2 $\rightarrow (x+1)^2$

$x = 2 \rightarrow (x-2)$ $x = 4 \rightarrow (x-4)$

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

$p(x) = (x^2+2x+1)(x^2-6x+8)$

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(11) continued $p(x) = x^2(x^2-6x+8)+2x(x^2-6x+8)+1(x^2-6x+8)$

$= x^4-6x^3+8x^2+2x^3-12x^2+16x+x^2-6x+8$

$= x^4-4x^3-3x^2+10x+8$

$\boxed{C}$

(12) $-.25$ $+.25$

31.75   32 oz   32.25

needs to be here

When in doubt, try them out.

(A) $|x-0.25| \le 32$

$-32 \le x-0.25 \le 32$

$+0.25 \quad +0.25 \quad +0.25$

$-31.75 \le x \le 32.25$

Nope.

(B) $|x+0.25| \le 32$

$-32 \le x+0.25 \le 32$

Nope. another negative will happen

(C) $|x-32| \le 0.25$

$-0.25 \le x-32 \le 0.25$

$+32 \quad +32 \quad +32$

$31.75 \le x \le 32.25$ This One! ☺

$\boxed{C}$

(13) $h(x) = \begin{cases} -3x & \text{for } x<2 \\ 4x+1 & \text{for } x \ge 2 \end{cases}$ $g(x) = \begin{cases} x^2+2 & \text{for } x<3 \\ x^3 & \text{for } x \ge 3 \end{cases}$

$3h(2) + 4g(1)$

$h(2) = 4(2)+1 = 8+1 = 9$

$3h(2) = 3(9) = 27$

$g(1) = 1^2+2 = 1+2 = 3$

$4g(1) = 4(3) = 12$

$3h(2) + 4g(1)$

$\downarrow \quad \downarrow$

$27 + 12 = 39$

$\boxed{A}$

Midterm Review p.6

(14) $9^{-3x+2} = 48$ variable in the exponent so logarithm needed

base = 9

exp = $-3x+2$

arg = 48

$b^x = a \rightarrow \log_b a = x$

$\log_9 48 = -3x+2$ change of base

$\frac{\log 48}{\log 9} = -3x+2$ $\log_b a = \frac{\log a}{\log b}$

$\frac{\log 48}{\log 9} - 2 = -3x$

$1.761859507 - 2 = -3x$

$\frac{-.2381404929}{-3} = \frac{-3x}{-3}$

$.07938016 \approx x$ $\boxed{A}$

closest .0794

(15) Parent function $y = |x|$

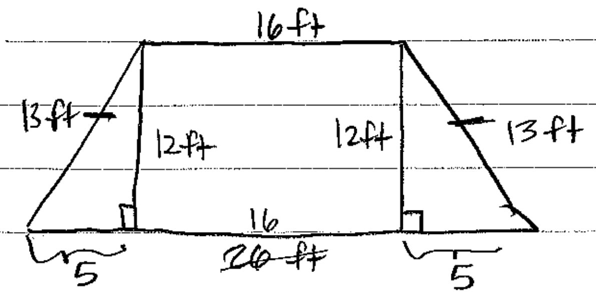
This is shifted down 2 units so the answer is A or B. If not stretched, the slope of absolute value is always $\frac{1}{1}$. This graph has a slope of $\frac{2}{1}$ or 2. That means $\boxed{B}$

$y = |2x| - 2$

horizontal compression

shift down

(16)




Need to find the area, I made two triangles and a rectangle $\boxed{A}$

$a^2+b^2=c^2$ → $b^2 = 144$

$5^2+b^2=13^2$ $b = 12$

triangles rectangle

$2(\frac{1}{2} \cdot 5 \cdot 12) + 16 \cdot 12 =$

# Midterm Review p.7

17 $x^2 + y^2 - 4x - 4y + 4 = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad -4 \quad -4$ Need to complete the square

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

$(x^2 - 4x + \underline{\quad}) + (y^2 - 4y + \underline{\quad}) = -4 + \underline{\quad} + \underline{\quad}$

$\frac{-4}{2} = -2 \quad (-2)^2 = 4 \qquad \frac{-4}{2} = -2 \quad (-2)^2 = 4$

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

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

radius $\sqrt{4} = 2$

center $(2,2)$

$\boxed{A}$