Honors Precalculus
Chapter 2/1st 6-Week Test (F-2013)
Part 1 – Calculator Active

~~48 pts~~ (~~88 pts~~ TOTAL)

Name: MAYO

(~~120 pts~~)
(~~100 pts TOTAL~~)
100 pts

1. The total sales of a company (in million dollars) for each year are shown in the table below.

0 1 2 3 4 → $y = 8.4x + 11.6$ COUNTS (120)

x (year)	2005	2006	2007	2008	2009
y (sales)	12	19	29	37	45

$\hat{y}$ (−1/3)

a) Find the least squares regression line for this data.

$\hat{y} = 8.4x - 16830.4$ (2)

$(\hat{y} = 8.4x + 11.6)$

$(y = 8.4x + 3.2)$

b) Interpret the slope of the regression line in terms of the context of the problem.

FOR EACH YR, SALES ↑ BY $8.4 MILLION

(1) PREDICTED (1) (1)

UNITS (1)

c) Use the least squares regression line as a model to estimate the sales of the company in 2012. Show set-up. Include units in your answer.

$y = 8.4(2012) - 16830.4 = \boxed{\$70.4 \text{ MILLION}}$

(1) (1)

D. HOW GOOD IS MODEL? SUPPORT ANSWER.

r, r^2, RESID PLOT.

(1)

2. Find the sum of the following infinite geometric series. Suggestion: begin by writing out terms. Show set-up.

$$\sum_{n=2}^{\infty} \frac{2^{n-1}}{3^{2n-2}}$$

$\frac{2^{2-1}}{3^{4-2}} = \frac{2}{3^2} = \frac{2}{9}$

$\frac{2^{3-1}}{3^{6-2}} = \frac{2^2}{3^4} = \frac{2}{9} \cdot \frac{2}{9}$

(.28571)

$a_1 = \frac{2}{9}$ $r = \frac{2}{9}$

$S = \frac{\frac{2}{9}}{1 - \frac{2}{9}} = \frac{\frac{2}{9}}{\frac{7}{9}} = \frac{2}{9} \cdot \frac{9}{7} = \boxed{\frac{2}{7}}$ (3)

(16)

3. After an oven is turned on, its temperature, T, is represented by the equation

$$T = 400 - 350(3.2)^{-0.1m}$$

where *m* represents the number of minutes after the oven is turned on and *T* represents the temperature of the oven, in degrees Fahrenheit. How many minutes does it take for the oven's temperature to reach 300° F. Solve the problem *algebraically* and round your answer to the nearest minute.

$300 = 400 - 350(3.2)^{-0.1m}$

$-100 = -350(3.2)^{-0.1m}$

$\frac{10}{35} = (3.2)^{-0.1m}$

$\ln\left(\frac{10}{35}\right) = -0.1m \ln(3.2)$

$m = \frac{\ln\left(\frac{10}{35}\right)}{\ln 3.2} / -0.1 \approx \boxed{11 \text{ MIN}}$

4

4. Two schools opened in the same year. Each had an initial population of 300 students. Colonial Village School's population increased ***constantly*** at a rate of 130 students per year. The population of Walker Middle School increased ***continuously*** by 20% per year.

On the 10th anniversary of the opening (end of year 10), which school had the greater population and by how many students? Include an expression for the population of each school and show your set-up.

CV: $P(t) = 300 + 130t$ 1 $P(10) = 1600$ 1

WMS: $P(t) = 300e^{.2t}$ 1 $P(10) = 2216.71 \approx 2217$ 1

(5 pts)

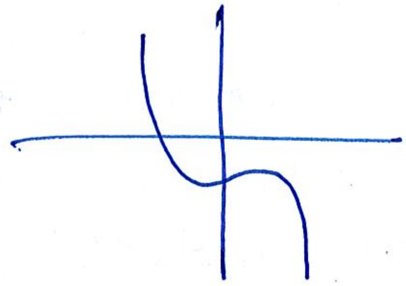
WMS HAD 617 MORE STUDENTS 1

NOT EXP. $-\frac{1}{2}$ P(9) -1

(9)

5. For $f(x) = -5x^5 + 3x^2 - 2$, give the following:

a) Domain: $\mathbb{R}$ 1



b) Range: $\mathbb{R}$ 1

c) End behavior: AS $x \to \infty$, $f(x) \to -\infty$
AS $x \to -\infty$, $f(x) \to \infty$ 2

d) Zeros: $x = -0.668$ 1

e) Y-intercept: $y = -2$ 1

f) Local maximum(s): $(0.621, -1.305)$ 1

2.0538E-6 $-\frac{1}{2}$

g) Local minimum(s): $(0, -2)$ 1

h) Where f(x) is increasing: $(0, 0.621)$ 1

i) Where f(x) is decreasing: $(-\infty, 0) \cup (0.621, \infty)$
1 1

(11)

$6 \quad 8 \quad 10 \quad 12 \quad 14$

6. Given the sequence: 6, 12, 20, 30, 42, 56, … , which of the following is the recursive form for the sequence?

a. $t_1 = 6,\ t_n = n + 2(t_{n-1} + 1)$ $\quad t_2 = 2 + 2(6+1) = 2 + 14 = 16$ ✗

b. $t_1 = 6,\ t_n = (t_{n-1} + 1)(n - 2)$ $\quad t_2 = (6+1)(2-2) = 0$ ✗

c. $t_1 = 6,\ t_n = 2(t_{n-1} + 2) - (n + 2)$ $\quad t_2 = 2(6+2) - (2+2) = 16 - 4 = 12$

d. $t_1 = 6,\ t_n = t_{n-1} + 2(n + 1)$ $\quad t_2 = 6 + 2(2+1) = 6 + 6 = 12$

$t_3 = 2(12+2) - (3+2) = 28 - 5 = 23$ ✗

$t_3 = 12 + 2(3+1) = 12 + 8 = 20$

3

7. Given the sequence: 1, 3, 3^2, 3^3, . . . , how many terms of the sequence must be added together for the sum to equal 3,280? Show work.

$a_1 = 3 \quad r = 3 \qquad S_n = \dfrac{a_1(1-r^n)}{1-r}$

3

$3280 = \dfrac{1(1-3^n)}{1-3} = \dfrac{1-3^n}{-2} \rightarrow 3^n = \cancel{6559}\ 6561$

$-6560 = 1 - 3^n \qquad \boxed{n = 8}$

$\ln 6561$

$n \ln 3 = \ln 6561$

$n = \dfrac{\ln 6561}{\ln 3}$

8.The first term of an infinite geometric sequence is 2. The sum of the sequence is 6. What is the common ration of the sequence?

$a_1 = 2 \qquad S = 6 \rightarrow 4 = 6r$

$r = \dfrac{2}{3}$

3

$6 = \dfrac{2}{1-r}$

$\left(\dfrac{4}{6}\right)$

$6 - 6r = 2$

9. Is the following series *convergent* or *divergent*? Justify your answer. If it is convergent, give its sum. Show work.

$$\pi + \frac{3\pi}{4} + \frac{9\pi}{16} + \frac{27\pi}{64} + \cdots$$

$a_1 = \pi$

$r = \dfrac{3}{4}$

3

CONV. SINCE $|r| < 1$

$S = \dfrac{\pi}{1 - \frac{3}{4}} = \dfrac{\pi}{1/4} = \boxed{4\pi}$

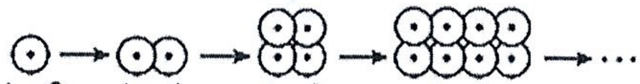
(12.566)

(12)

Honors Precalculus **Name:** MAYO
Chapter 2/1st 6-Week Test (F-2013)
Part 2 – Calculator Inactive

7. ③ 7. D

The accompanying diagram represents the biological process of cell division.



If this process continues, which expression best represents the number of cells at any time, t?

A. $t + 2$ B. $2t$ C. t^2 D. 2^t

8. ③ 8. C

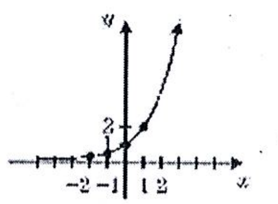
Which is the equation of the graph below?

A. $y = \log_2 x$

B. $y = -\log_2 x$

C. $y = 2^x$

D. $y = 2^{-x}$

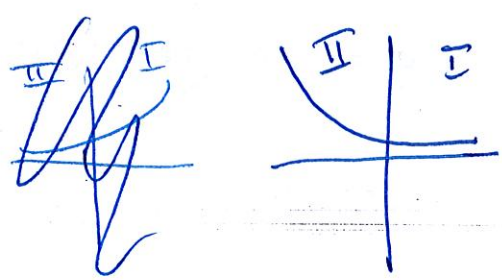


9. ③ 9. B

The graph of the equation $y = (\frac{1}{4})^x$ lies in Quadrants

A. I and IV B. I and II

C. III and IV D. II and III



(6)

10.

If $\log_2(x^2 - 1) = \log_2 8$, the the solution set for x is

A. $\{3, -3\}$ B. $\{-3\}$

C. $\{3\}$ D. $\{\ \}$

3 10. A

11.

If $r = \sqrt[3]{\frac{A^2B}{C}}$, then $\log r$ can be represented by

A. $\frac{1}{6}\log A + \frac{1}{3}\log B - \log C$

B. $3(\log A^2 + \log B - \log C)$

C. $\frac{1}{3}\log(A^2 + B) - C$

D. $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

3 11. D

12.

For which value of x is $y = \log x$ undefined?

A. 0 B. $\frac{1}{10}$ C. π D. 1.438

3 12. A

6

13. Solve $\log_3(x^2-4) - \log_3(x+2) = 2$. Show work.

$$\log_3 \frac{x^2-4}{x+2} = 2$$

$$\frac{x^2-4}{x+2} = 9$$

$$x^2 - 4 = 9x + 18$$

$$x^2 - 9x - 22 = 0$$

$$(x-11)(x+2) = 0$$

$\boxed{x = 11}$ $\cancel{x} = -2$ DNE

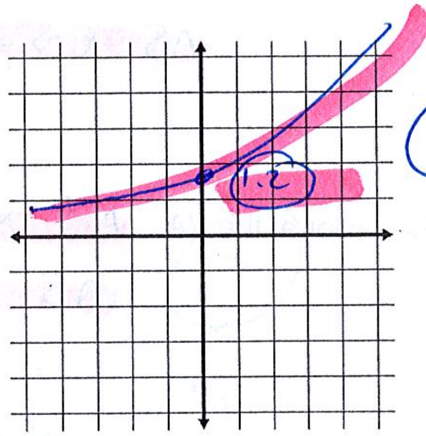
3

-1

DID NOT CONSIDER $x = -2$

-1

14. Graph $f(x) = 1.2e^{0.2t}$ and give the following:



1

a) Domain: $\mathbb{R}$ 1

b) Range: $\mathbb{R}^+$ 1

c) End behavior: AS $x \to \infty$, $f(x) \to \infty$

AS $x \to -\infty$ $f(x) \to 0^+$

2

d) Zeros: NONE 1

e) Y-intercept: $y = 1.2$ 1 NO $y =$ $-\frac{1}{2}$

f) Where f(x) is increasing: $\forall x$ 1

g) Where f(x) is decreasing: NEVER 1

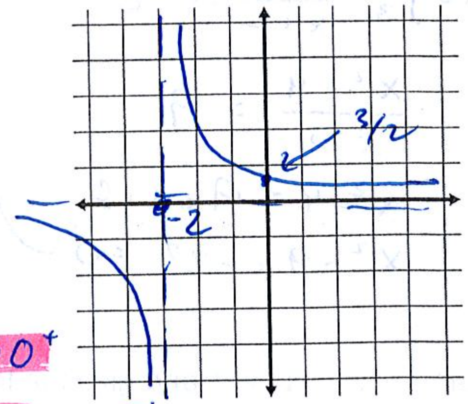
(12)

15. Graph $f(x) = \frac{3}{x+2}$ and give each of the following:

a) VA: $x = -2$ 1

b) HA: $y = 0$ 1

c) Y-intercept: $y = \frac{3}{2}$ 1



d) End behavior: AS $x \to \infty$, $f(x) \to 0^+$
AS $x \to -\infty$, $f(x) \to 0^-$ 2

e) Behavior at the VA: AS $x \to -2^+$, $f(x) \to +\infty$ 2
AS $x \to -2^-$, $f(x) \to -\infty$

f) Domain: $\mathbb{R}$ exc $x = -2$ 1

g) Range: $\mathbb{R}$ exc $y = 0$ 1

16. Given $f(x) = \frac{x^2-9}{x-3}$ $\quad \frac{\cancel{(x-3)}(x+3)}{\cancel{x-3}}$

a) What is the domain of f(x)?
$\mathbb{R}$ exc $x = 3$ 1

b) What is the range of f(x)? $\mathbb{R}$ exc $y = 6$ 1

c) Describe the graph of f(x). A LINE $f(x) = x+3$
WITH HOLE AT $x = 3$ 1

(12)

17. Solve $x^3 + 2x^2 \geq 3x$ algebraically. Show work.

$x^3 + 2x^2 - 3x \geq 0$

$x(x^2 + 2x - 3) \geq 0$

$x(x+3)(x-1) \geq 0$

$-\quad + \quad - \quad +$

$-3 \quad 0 \quad 1$

3

$[-3, 0] \cup [1, \infty)$

No $x=0$

-1.5

18. Solve $e^{2x} - e^x - 6 = 0$. Show work.

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

$e^x = 3 \qquad \cancel{e^x = -2}$ DNE

3

$\boxed{x = \ln 3}$

$e^x = 3$

-1

19. Find the equation of the *slant asymptote* of the graph of $(x) = \frac{-3x^2+2}{x-1}$. Show work.

$$\begin{array}{r} -3x - 3 - \frac{1}{x-1} \\ x-1 \overline{)\, -3x^2 + 2} \\ -(-3x^2 + 3x) \\ \hline -3x + 2 \\ -3x + 3 \\ \hline -1 \end{array}$$

$\boxed{y = -3x - 3}$

2

WICKED SMAAHT

(8)