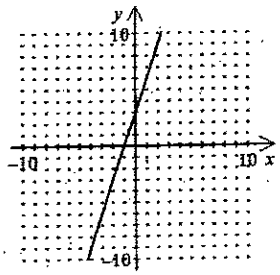
Pre-Calculus
1st Semester Mid-Term Practice

Name: _____
Period: ____

DIRECTIONS: Solve each of the following problems. Decide which the best of the choices given is and write it in the space provided.

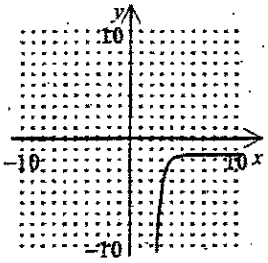
C 1. Identify the x-intercept and the y-intercept.



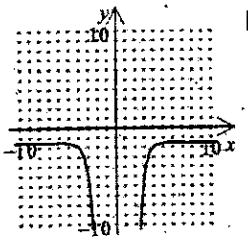
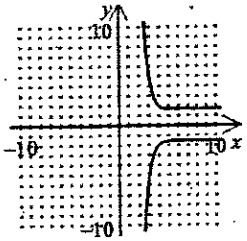
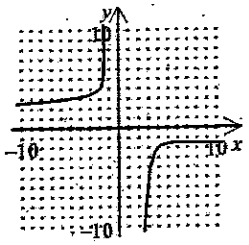
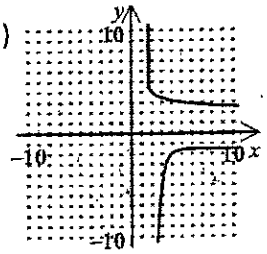
Ch 1

a) (0, 0); (0, 2)
b) (3, 0); (0, -1)
c) (-1, 0); (0, 3)
d) (2, 0); (0, 0)

A 2. Assume that the graph is a portion of a complete graph with y-axis symmetry. Which graph below is the complete graph?



Ch 1

a) 
b) 
c) 
d) 

A 3. A model for the demand for an mp3 player is $d = -3p^2 + 270p - 40$ where d is the number of mp3 players a manufacturer can sell at a price of p dollars each. Find the price that results in the maximum demand for mp3 players.

Ch 1

$d = -3(p^2 - 90p + 2025) - 40 - (-6075)$

$d = -3(p-45)^2 + 6035$

vertex (45, 6035) max

a) $45
b) $6.67
c) $90
d) None of these

A 4. In 2000, the average price of a downtown apartment in Lake County was $98,000. By 2007, the average price of a downtown apartment was $112,000. Which of the following is a linear model for the price P of a downtown apartment in Lake County, in terms of the year t? Let t = 0 correspond to 2000.

Ch 1

$m = \frac{112-98}{7-0} = 2{,}000$

a) $P = 2000t + 98{,}000$
b) $P = 14{,}000t + 98{,}000$
c) $P = 112{,}000 - 14{,}000t$
d) $P = 112{,}000 - 2000t$

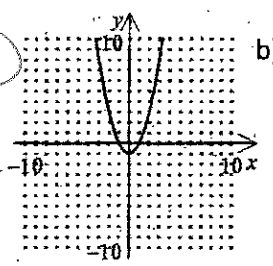
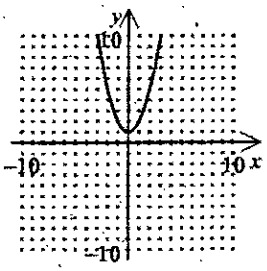
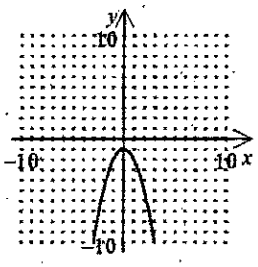
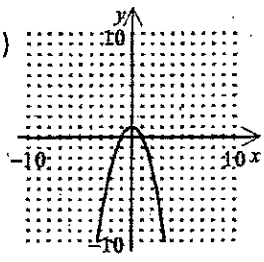
C 5. Determine which set of ordered pairs (x, y) represents y as a function of x.

a) {(4, -2), (-8, -1), (-8, 4), (-1, -8)}
b) {(4, -2), (-2, -8), (4, -1)}
c) {(4, -2), (-2, 4), (-1, -1)}
d) {4, -2, -8, -1}

Ch 1

A 6. Identify the graph of the quadratic function $f(x) = x^2 - 1$

Ch 1

a) 
b) 
c) 
d) 

B 7. Identify the right-hand and left-hand behavior of the graph of the polynomial function $f(x) = -6x^7 - 2x$

a) Falls to the left. Rises to the right.
b) Rises to the left. Falls to the right.
c) Rises to the left. Rises to the right.
d) Falls to the left. Falls to the right

Ch 2

C 8. Given that one zero of $P(x) = x^3 + 7x^2 + 25x + 39$ is $-2 + 3i$, which of the following is also a zero of P(x)? Ch 2

a) $3 - 2i$
b) $2 + 3i$
c) $-2 - 3i$
d) $-3 - 2i$

C 9. Find the four real zeros of the polynomial $f(x) = x^4 + 10x^3 + 36x^2 + 56x + 32$

a) 2, -2, -4, 2
b) -2, -2, 4, -2
c) -2, -2, -4, -2
d) 2, -2, -4, -2

A 10. Find the horizontal asymptote of the graph of $f(x) = \frac{4}{x-9}$. Ch 2

a) y = 0
b) x = 0
c) y = 4
d) x = 9

C 11. Find the vertical asymptote(s), if any, for $f(x) = \frac{3x-7}{x^2-5x+6}$ $(x-3)(x-2)$ Ch2

a) x = 7, x = 2
b) x = 2, x = 3, y = 7/3
c) x = 2, x = 3
d) y = 2, y = 3

C 12. In 2005, the population of a country was estimated at 4 million. For any subsequent year the population P(t) in millions is $P(t) = \frac{240}{5+54.99e^{-0.0208t}}$ where t is the number of years since 2005. Use a graphing calculator to estimate the population in 2018. Ch3

a) 5,158,000
b) 5,206,000
c) 5,111,000
d) 5,016,000

D 13. Condense the expression to the logarithm of a single quantity: $5 \log_{10} x + 6 \log_{10} (x + 2)$ Ch 3

a) $30 \log_{10} x(x + 2)$
b) $\log_{10} \frac{x^5}{(x+2)^6}$
c) $\log_{10} x(x + 2)$
d) $\log_{10} x^5(x + 2)^6$

B 14. The amount of time t in years required for a certain radioactive material to decompose is $t = \frac{\ln R - \ln A}{k}$ where R is the mass of the substance remaining after decomposition, A is the original mass of the substance, and k is a constant related to a particular material. Find the time required for 99 grams of a radioactive substance to decompose so that only 33 grams remain if k = -0.163. Ch 3

a) 67.6 years
b) 6.8 years
c) 28.3 years
d) 0.1 year

A 15. Solve the exponential equation: $\frac{600}{1+e^{-x}} = 575$ Ch 3

a) 3.135
b) -0.715
c) 3.062
d) -0.672

A 16. Find the value of x: $3 \ln (4x) = 13$ Ch3

a) 19.049
b) 1.083
c) 17.333
d) 0.367

B 17. The number of bacteria present in a culture is $B = 1000e^{0.276t}$ where t is the time in minutes. Find the time required, to the nearest half minute, to have 6000 bacteria present. Ch 3

a) 5.5 min
b) 6.5 min
c) 7.0 min
d) 6.0 min

A 18. An automobile manufacturer is introducing a new fuel-efficient model and estimates the demand for the car as $N = 54{,}000 \ln(6t + 8)$ where N is the estimated number of cars to be sold and t is the number of years after the car is introduced. When will the demand be 215,000 cars? $215000 = 54000 \ln(6t+8)$ Ch3

a) 7.6 years b) 6.3 years c) 8.3 years d) 10.3 years

A 19. The number of bison per acre of range in the wild is $N = 2.5 \times 10^{5 - 0.004w}$ where N is the number of bison per acre and w is the average weight of the bison in pounds. Find the average weight of a bison in a herd that has an average of three animals per acre of range. $3 = 2.5 \cdot 10^{5-.004w}$ Ch3

a) 1230 lb b) 1353 lb c) 1107 lb d) 1280 lb

D 20. A virus is accidentally brought to a remote village with a population of 7500 that has never been exposed to the disease. The spread of the virus is modeled by $y = \frac{7500}{1+7499e^{-0.6t}}$ where t is the time in days since the virus was introduced. How many villagers will be infected after 5 days? Ch3

a) 21 b) 23 c) 18 d) 20

C 21. Find the midpoint of the line segment connecting (13, 17) and (-12, -18). Ch1 $\left(\frac{13+-12}{2}, \frac{17+-18}{2}\right)$

a) (-1, 1) b) (25/2, 35/2) c) (1/2, -1/2) d) (1, -1)

B 22. Find the slope-intercept form of the equation of the line through the point (7, 4) and parallel to the line $2x - 7y = -6$. Ch1 $-7y = -2x - 6$, $y = \frac{2}{7}x + \frac{6}{7}$, $m = \frac{2}{7}$, $y = mx + b$, $4 = \frac{2}{7} \cdot 7 + b$, $b = 2$

a) $y = -\frac{2}{7}x + 2$ b) $y = \frac{2}{7}x + 2$ c) $y = \frac{7}{2}x - \frac{1}{2}$ d) $y = \frac{2}{7}x - \frac{1}{2}$

A 23. If $f(x) = 3x + 6$ and $g(x) = 3x + 6$, find $(f \circ g)(-4)$. Ch1 $f(g(-4)) = f(-6) = -12$

a) -12 b) -11 c) -15 d) -14

D 24. Find the inverse of the function $f(x) = 2x + \frac{1}{3}$. $x = 2y + \frac{1}{3}$ $x - \frac{1}{3} = 2y$ $\frac{1}{2}x - \frac{1}{6}$ Ch1

a) $f^{-1}(x) = \frac{2}{3}x - \frac{1}{2}$ b) $f^{-1}(x) = \frac{3}{2}x + \frac{1}{2}$ c) $f^{-1}(x) = \frac{1}{3}x + \frac{1}{6}$ d) $f^{-1}(x) = \frac{1}{2}x - \frac{1}{6}$

D 25. Use synthetic division to determine which of the following polynomials is NOT a factor of $x^3 + 7x^2 + 14x + 8$. Ch2

a) $x + 1$ (-1 | 1 7 14 8 / -1 -6 -8 / 1 6 8 10) b) $x + 2$ (-2 | 1 7 14 8 / -2 -10 -8 / 1 5 4 10) c) $x + 4$ (-4 | 1 7 14 8 / -4 -12 -8 / 1 3 2 10) d) $x - 4$ (4 | 1 7 14 8 / 4 / 1 12 1)

C 26. $(-8 + 4i)(5 - 7i) = -40 + 56i + 20i + 28$ Ch2

a) -68 + 76i b) -12 − 76i c) -12 + 76i d) -68 + 36i

D 27. Determine the maximum number of zeros of the polynomial function $f(x) = -4x^8 - 9x^7 + 9x - 4$ Ch2

a) 7 b) -4 c) 15 d) 8

D 28. Determine the domain of the function $f(x) = \frac{6x}{x(x-9)}$. Ch2

a) $(-\infty, -9)(-9,0)(0, 9)(9, \infty)$ b) $(-\infty, -3)(-3, 0)(0, 3)(3, \infty)$
c) $(-\infty, -3)(-3, 3)(3, \infty)$ d) $(-\infty, 0)(0, 9)(9, \infty)$

FREE RESPONSE PRACTICE

The table shows the population (in millions) of five countries in 2000 and the populations (in millions) for the year 2010.

Country	2000	2010
Bulgaria	7.8	7.1
Canada	31.3	34.3
China	1268.9	1347.6
United Kingdom	59.5	61.2
United States	282.3	309.3

a) Find the exponential growth or decay model $y = ae^{bt}$ or $y = ae^{-bt}$ for the population of each country by letting t = 0 correspond to 2000. Use the model to predict the population of each country in 2030.

Bulgaria
$y = 7.8e^{rt}$
$7.1 = 7.8e^{r(10)}$

Canada
$y = 31.3e^{rt}$
$34.3 = 31.3e^{r(10)}$

China
$y = 1268.9e^{rt}$
$1347.6 = 1268.9e^{r(10)}$

UK
$y = 59.5e^{rt}$
$61.2 = 59.5e^{r(10)}$

US
$y = 282.3e^{rt}$
$309.3 = 282.3e^{r(10)}$

	Model	Pop. in 2030
Bulgaria	$y = 7.8e^{-.00940t}$	5.883 million ppl
Canada	$y = 31.3e^{.00915t}$	41.187 million ppl
China	$y = 1268.9e^{.00602t}$	1,520.061 million ppl
United King	$y = 59.5e^{.00282t}$	64.753 million ppl
United States	$y = 282.3e^{.00913t}$	371.248 million ppl

b) Which country is growing at the fastest rate? Which country is growing the slowest? Explain.

Canada is growing the fastest because they have the highest rate.

the UK is growing slowest becaus they have a rate that is smallest, but still positive