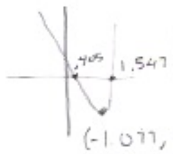
Name KEY Period ________ Due ____________

Precalculus: Quarter 2 Review B

You <u>may use a calculator</u> to solve the problems on this review.

Identify all extrema as local or absolute max or mins and find all x-intercepts.

1. $f(x) = x^4 - 5x + 2$



abs min of -2.04
x-int $(.405, 0)$ $(1.547, 0)$

2. $f(x) = -x^3 + 5x - 1$

local min of -5.3
local max of 3.3
x-int: $(-2.33, 0)$ $(.202, 0)$ $(2.213, 0)$

3. $f(x) = 2x^4 - 3x^2 + x - 5$

x-int $-1.65, 1.567$
local min: -5.306
local max: -4.915
abs min of: -7.029

Write the equation of the line in $y = mx + b$ form.

4. slope = 4, goes through the point (2, 6)

$y = 4(x-2) + 6$
$y = 4x - 8 + 6$
$\boxed{y = 4x - 2}$

5. goes through the points (2, 5) and (−1, 8)

$\frac{8-5}{-1-2} = \frac{3}{-3} = -1$ ← slope
$y = -1(x-2) + 5$
$y = -x + 2 + 5$
$y = -x + 7$

Write the quadratic in vertex form.

6. $y = x^2 + 8x + 10$

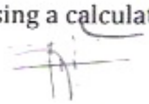
$(x^2 + 8x + \underline{16}) + 10 - 16$
$\boxed{y = (x+4)^2 - 6}$

7. $y = x^2 - 6x + 3$

$y = (x^2 - 6x + \underline{9}) + 3 - 9$
$\boxed{y = (x-3)^2 - 6}$

Evaluate the limits using a calculator.

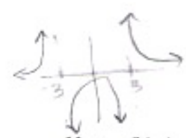
8. $f(x) = \dfrac{3x}{x-2}$



$\lim\limits_{x\to\infty} f(x) = 3$ $\lim\limits_{x\to 2^+} f(x) = +\infty$

$\lim\limits_{x\to -\infty} f(x) = 3$ $\lim\limits_{x\to 2^-} f(x) = -\infty$

9. $f(x) = \dfrac{2}{x^2 - 9}$



$\lim\limits_{x\to\infty} f(x) = 0$ $\lim\limits_{x\to -3^+} f(x) = -\infty$

$\lim\limits_{x\to -\infty} f(x) = 0$ $\lim\limits_{x\to -3^-} f(x) = +\infty$

Find the zeros of each polynomial.

10. $f(x) = x^3 + 10x^2 + 25x + 12$

−3	1	10	25	12
	↓	−3	−21	−12
	1	7	4	0

$x^2 + 7x + 4 = 0$

$x = \dfrac{-7 \pm \sqrt{49 - 4(1)(4)}}{2(1)}$

$\boxed{x = \dfrac{-7 \pm \sqrt{33}}{2}}$

11. $f(x) = x^4 - 5x^3 + 7x^2 + 7x - 20$

$x = -1.37$

$x = 2.267$

(other 2 are imaginary)

Solve the inequality.

12. $x^4 - 4x^2 + x + 1 \geq 0$

$\boxed{(-\infty, -2.06) \cup (-.4, .69) \cup (1.76, \infty)}$

13. $0 < x^3 + 3x^2$

$x^2(x+3)$

$x = 0, -3$

$\boxed{(-3, 0) \cup (0, \infty)}$

Divide the polynomials.

14. $\left(2x^3 - 3x^2 - 5x - 12\right) \div (x - 3)$

$$\begin{array}{r|rrrr} 3 & 2 & -3 & -5 & -12 \\ & \downarrow & 6 & 9 & 12 \\ \hline & 2 & 3 & 4 & 0 \end{array}$$

$\boxed{2x^2 + 3x + 4}$

15. $\left(3x^3 + 5x^2 + 8x + 7\right) \div (3x + 2)$

$x^2 + x + 2 \quad R\ 3$

$3x+2 \overline{)\, 3x^3 + 5x^2 + 8x + 7}$

$-3x^3 \mp 2x^2$

$3x^2 + 8x + 7$

$-3x^2 \mp 2x$

$6x + 7$

$-6x \mp 4$

3

OR

$(x^2 + x + 2)(3x + 2) + 3$

16. $\left(2x^4 - x^3 - 2\right) \div \left(2x^2 + x + 1\right)$

$\boxed{x^2 - x \quad R = x - 2}$

$2x^2 + x + 1 \overline{)\, 2x^4 - x^3 + 0x^2 + 0x - 2}$

$-2x^4 \mp x^3 \mp x^2$

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

$+2x^3 + x^2 + x$

$x - 2$

17. Evaluate the exponential function.

$f(x) = 3 \cdot 4^x$, when $x = \frac{3}{2}$

$3 \cdot 4^{3/2}$

$\sqrt{4^3}$

$4\ 4\ 4$

$2\ 2$

$3 \cdot 8 = 24$

18. The population of Wellington was 72,000 in 1970. Assume that the population increases by 2.5% each year.

a) Write an exponential function that satisfies the given conditions.

b) What will the population be in 2015? $t = 45$

c) When will the population reach 1 million?

a) $P = 72{,}000(1 + .025)^t$

b) $72{,}000(1.025)^{45} \approx 218729.$

c) $\frac{1{,}000{,}000}{72{,}000} = \frac{72{,}000(1.025)^t}{72{,}000}$

$\frac{125}{9} = (1.025)^t$

$\rightarrow \ln\left(\frac{125}{9}\right) = t \ln(1.025)$

$\frac{\ln\left(\frac{125}{9}\right)}{\ln(1.025)} = \frac{t \ln(1.025)}{\ln(1.025)}$

$t \approx 106.5$ years after 1970

19. The half-life of a certain substance is 13 days. There are 200 mg initially.

a) Write an exponential function that satisfies the given conditions.

b) How many milligrams will there be after 50 days?

c) When will there be 5 ~~grams~~ mg remaining?

a) $P(t) = 200(1/2)^{t/13}$

b) $P(50) = 200(\frac{1}{2})^{50/13} \approx 13.9$ mg

c) $5 = 200(1/2)^{t/13}$

$t \approx 69.185$ days

20. The population in wolves in a state park after t years is represented by the logistic function below.

$$P(t) = \frac{1200}{1+4e^{-0.2t}}$$

a) What was the initial population of wolves in the state park?

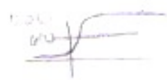
b) When will there be 600 wolves in the park?

c) What is the maximum number of wolves that could live in the state park?

a) $t = 0$ $\quad P(0) = \frac{1200}{1+4e^{-.2(0)}} = \frac{1200}{5} =$ 240 wolves

b) $600 = \frac{1200}{1+4e^{-.2t}}$ $\quad t \approx 6.9$ years

c) 1200 wolves



Evaluate.

21. $\log \frac{1}{100}$

$\log_{10} 10^{-2}$

-2

22. $\ln \sqrt[3]{e^2}$

$\ln e^{2/3}$

$\frac{2}{3}$

23. $\log_5 125$

$\log_5 5^3$

3

Solve for x.

24. $\log_{10} x = 3$

$10^3 = x$

$x = 1000$

25. $\ln_e x = 2$

$e^2 = x$