

TO: Next Year's Calculus Students
FROM: Miss Mardi (Nott), Calculus Teacher

Attached is a summer homework packet, which will be due the first day of Calculus class in August. The material in the packet should be material you learned in Algebra II and Precalculus.

You will turn in the packet the first day of Calculus class, and it will count as a daily grade. During the first week of school, you will take a test on the material in the packet.

My recommendation is that you look over the problems in the packet when you receive it but that you wait until two weeks before school starts to work the problems so that you will remember the material very well when school starts.

We will be using the TI-84 graphing calculator in Calculus. The price varies some so you should compare the prices at various places before purchasing one. You can buy a TI-84 at stores such as Target, Walmart, Best Buy, Office Depot, Office Max, and Staples, as well as from online sites like Amazon.

You will be expected to have a TI-84 the first week of school.

I am looking forward to seeing you in Calculus in August!

AB students do: #1-55

BC students do: ALL

CALCULUS
SUMMER HOMEWORK

This homework packet is due the first day of school. It will be turned in the first day of Calculus class and will count as a daily grade. You will take a test on the material in the packet during the third week of school.

Work these problems on notebook paper. All work must be shown.
Use your graphing calculator only on problems 44 - 55.

Find the x - and y -intercepts and the domain and range, and sketch the graph. No calculator.

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|---|---|---|
| 1. $y = \sqrt{x-1}$ | 2. $y = \sqrt{9-x^2}$ | 3. $y = \frac{ x }{x}$ |
| 4. $y = \sin x, -2\pi \leq x \leq 2\pi$ | 5. $y = \cos x, -2\pi \leq x \leq 2\pi$ | 6. $y = \tan x, -2\pi \leq x \leq 2\pi$ |
| 7. $y = \cot x, -2\pi \leq x \leq 2\pi$ | 8. $y = \sec x, -2\pi \leq x \leq 2\pi$ | 9. $y = \csc x, -2\pi \leq x \leq 2\pi$ |
| 10. $y = e^x$ | 11. $y = \ln x$ | |
| 12. $y = \begin{cases} -1, & \text{if } x \leq -1 \\ 3x+2, & \text{if } x < 1 \\ 7-2x, & \text{if } x \geq 1 \end{cases}$ | 13. $y = \begin{cases} x^2+1, & \text{if } x > 0 \\ -2x+2, & \text{if } x \leq 0 \end{cases}$ | |

Find the asymptotes (horizontal, vertical, and slant), symmetry, and intercepts, and sketch the graph. No calculator.

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|-------------------------|-----------------------------|----------------------------------|--------------------------------|
| 14. $y = \frac{1}{x-1}$ | 15. $y = \frac{1}{(x+2)^2}$ | 16. $y = \frac{2(x^2-9)}{x^2-4}$ | 17. $y = \frac{x^2-2x+4}{x-1}$ |
|-------------------------|-----------------------------|----------------------------------|--------------------------------|

Solve. No calculator.

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|------------------------|----------------------------------|-------------------------------|--|
| 18. $x^2 - x - 12 > 0$ | 19. $(x-2)^2(x+1)^3(x-5) \leq 0$ | 20. $\frac{3x-2}{x+4} \leq 0$ | 21. $\frac{(2x+5)(x-1)^2}{(x+2)^3} \geq 0$ |
|------------------------|----------------------------------|-------------------------------|--|

Evaluate. No calculator.

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|---------------------------|---------------------------|---------------------------|
| 22. $\cos \frac{5\pi}{6}$ | 23. $\sin \frac{3\pi}{2}$ | 24. $\tan \frac{5\pi}{4}$ |
| 25. $\sin \frac{7\pi}{4}$ | 26. $\cos \pi$ | 27. $\tan \frac{2\pi}{3}$ |
| 28. $\sec \frac{4\pi}{3}$ | 29. $\csc \frac{\pi}{4}$ | 30. $\cot \frac{2\pi}{3}$ |

Evaluate. No calculator.

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| 31. $\tan \left(\cos^{-1} \left(-\frac{\sqrt{3}}{2} \right) \right)$ | 32. $\sec \left(\arcsin \left(-\frac{\sqrt{2}}{2} \right) \right)$ |
| 33. $\cos \left(\sin^{-1} (2x) \right)$ | 34. $\sec \left(\arctan (4x) \right)$ |

Solve. Give exact answers in radians, $0 \leq x \leq 2\pi$. No calculator.

35. $2 \cos^2 x + 3 \cos x - 2 = 0$ 36. $2 \sin^2 x - \cos x = 1$ 37. $\sin(2x) = \cos x$
 38. $2 \cos(2x) + 1 = 0$ 39. $2 \csc^2 x + 3 \csc x - 2 = 0$ 40. $\tan^2 x - \sec x = 1$
 41. $2 \cos\left(\frac{x}{3}\right) - \sqrt{3} = 0$ 42. $\tan(2x) = -\sqrt{3}$ 43. $2 \sin(3x) - \sqrt{3} = 0$

Solve. Show all steps. Use your calculator, and give decimal answers correct to **three** decimal places.

44. $e^{2x+3} = 37$ 45. $e^{2x} - 5e^x + 6 = 0$ 46. $e^x - 12e^{-x} - 1 = 0$
 47. $\frac{50}{4 + e^{2x}} = 11$ 58. $\log_4(x^2 - 3x) = 1$ 49. $\ln(5x - 1) = 3$
 50. $\log_2(x + 3) + \log_2(x - 1) = \log_2 12$ 51. $\log_8(x + 5) - \log_8(x - 2) = 1$
 52. $\log_6(\log_4(\log_2 x)) = 0$ 53. $\log_3(\log_2(\log_5 25)) = x$

54. The number of students in a school infected with the flu t days after exposure is modeled by the

$$\text{function } P(t) = \frac{300}{1 + e^{4-t}}.$$

- (a) How many students were infected after three days?
 (b) When will 100 students be infected?

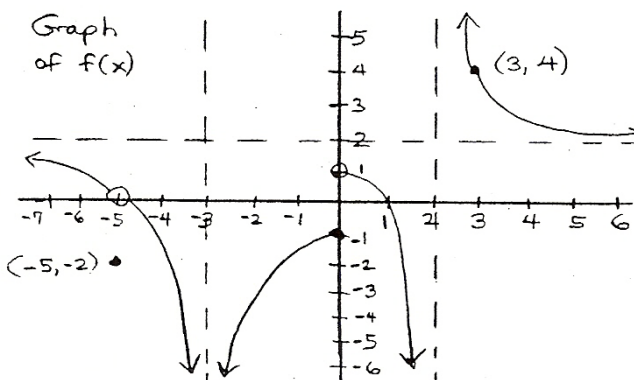
55. Exponential growth is modeled by the function $n = n_0 e^{kt}$. A culture contains 500 bacteria when $t = 0$.

After an hour, the number of bacteria is 1200.

- (a) How many bacteria are there after four hours?
 (b) After how many hours will there be 8000 bacteria?

Use the figure to find the limit. No calculator.

56. $\lim_{x \rightarrow 3} f(x)$ 57. $\lim_{x \rightarrow \infty} f(x)$
 58. $\lim_{x \rightarrow 2^+} f(x)$ 59. $\lim_{x \rightarrow 0} f(x)$
 60. $\lim_{x \rightarrow -\infty} f(x)$ 61. $\lim_{x \rightarrow -5} f(x)$



Evaluate. Show supporting work for each problem (algebraic steps or sketch). No calculator.

62. $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3}$ 63. $\lim_{x \rightarrow 0} \frac{(x-5)^2 - 25}{x}$ 64. $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$
 65. $\lim_{x \rightarrow -6} \frac{x + 6}{x^2 + 3x - 18}$ 66. $\lim_{x \rightarrow -2} \frac{x^3 + 8}{x + 2}$ 67. $\lim_{x \rightarrow \infty} \frac{3x - 5x^2}{4x^2 + 1}$

TURN->>>

Evaluate. Show supporting work for each problem (algebraic steps or sketch). No calculator.

$$68. \lim_{x \rightarrow 3^+} \frac{1}{x-3}$$

$$69. \lim_{x \rightarrow 3^-} \frac{1}{x-3}$$

$$70. \lim_{x \rightarrow 3} \frac{1}{x-3}$$

$$71. \lim_{x \rightarrow 3} \frac{1}{(x-3)^2}$$

$$72. \lim_{x \rightarrow 3^+} \llbracket x-1 \rrbracket$$

$$73. \lim_{x \rightarrow 3^-} \llbracket x-1 \rrbracket$$

$$74. f(x) = \begin{cases} 1-x, & x \leq 1 \\ x^2, & x > 1 \end{cases}$$

$$(a) \lim_{x \rightarrow 1^-} f(x)$$

$$(b) \lim_{x \rightarrow 1^+} f(x)$$

$$(c) \lim_{x \rightarrow 1} f(x)$$

$$75. f(x) = \begin{cases} \frac{x^2 - x - 6}{x-3} & \text{if } x \neq 3 \\ 4 & \text{if } x = 3 \end{cases}$$

$$(a) \lim_{x \rightarrow 3} f(x)$$

$$(b) f(3)$$

Use the **definition of the derivative** to find the derivative. No calculator.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}. \text{ (You must **know** this formula.)}$$

$$76. f(x) = x^2 - 8x$$

$$77. f(x) = \sqrt{x+9}$$

$$78. f(x) = \frac{3}{x-4}$$

$$79. f(x) = x^3 + 2x^2 - x + 4$$

Use the differentiation rules (power rule, product rule, quotient rule) to find the derivative. Do not leave negative exponents or complex fractions in your answers. No calculator.

$$80. f(x) = 3x^4 - 5x^3 + \frac{2}{x} + 6x^{2/3} - 12$$

$$81. f(x) = \frac{2x^2 - 3x + 1}{x}$$

$$82. f(x) = \sqrt{x} + \sqrt[3]{x}$$

$$83. f(x) = (6x+5)(x^3-2)$$

$$84. f(x) = \frac{x^3 + 5x - 3}{x^2 - 1}$$

$$85. \text{ Given the function } f(x) = x^4 - 3x^2 + 7.$$

(a) Use the differentiation rules to find $f'(x)$.

(b) Write the equation of the tangent line to f at $(1, 5)$. Leave your equation in point-slope form.