

MA 15910 Review Problems for Exam 3

For problems 1, 2, and 3: Find equation of any vertical or horizontal asymptotes. If there are none, write 'none'.

1) $y = \frac{-2x}{x^2 - 5x + 6}$

2) $f(x) = \frac{3x^2 - 3x - 6}{2x^2 - 6x - 20}$

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

Solve each exponential equation.

4) $3^{x+1} = \frac{1}{27}$

5) $4^{2x+1} = 8^{x-3}$

6) $27^x = 9^{x^2+x}$

Compound interest formulas: $A = P\left(1 + \frac{r}{m}\right)^{mt}$ $A = Pe^{rt}$

7) Find the accumulated amount if \$5000 is invested at 6% annual interest compounded quarterly for 6 years.

8) How long would it take (to the nearest tenth of a year) for \$1000 to accumulate to \$1250 at 4% annual interest rate compounded continuously?

9) Write $4^{0.5} = 2$ in logarithmic form.

10) Use your calculator to approximate $\ln 35.6$ and $e^{2.3}$.

11) Use your calculator and the change of base formula to approximate $\log_3 17$ to 4 decimal places.

Solve each equation. Round to 4 decimal places, if necessary.

12) $\log_6(x+1) = 2$

13) $\log(x+5) + \log(x+2) = 1$

14) $3^{x+2} = 7^x$

15) Suppose $\log_b 2 = x$ and $\log_b 5 = y$. Use the properties of logarithms to find $\log_b 20$.

16) Evaluate $\log_4 64$ and $\log_3 \frac{1}{9}$ without a calculator.

- 17) Use the properties of logarithms to write the expression as a sum, difference, or product of simpler logarithms. Simplify where possible.

$$\log_4 \left(\frac{16p}{\sqrt{q}} \right)$$

- 18) Find each limit, if it exists. (a) $\lim_{x \rightarrow \infty} \frac{3x^2 - 5}{2x - 5x^2}$ (b) $\lim_{x \rightarrow -\infty} \frac{5x - 3}{2x^2 + 7x - 1}$

Find each derivative.

19) $y = -14e^{2x}$

20) $f(x) = -2x^2 e^{-3x}$

21) $y = \frac{\ln(2x+6)}{x+3}, x > -3$

22) $y = (x^3 + e^{2x})^3$

23) $f(x) = \frac{e^x(x^2+2)}{\ln x}$

24) $y = (3x^2 - 5x)^3$

25) $g(x) = \sqrt{(3x^3 - 5x^2)^3}$

- 26) Find the slope of the tangent line and the equation of the tangent line to the curve $y = xe^x$ at the point where $x = 1$.

- 27) What is the slope of the tangent line to $f(x) = (3x^2 - x)^{-1}$ at the point $(1, \frac{1}{2})$?

- 28) Find any open intervals where these functions are increasing.

(a) $f(x) = 4x^3 + 8x^2 - 16x + 11$

(b) $g(x) = \frac{15}{2x+7}$

Find the locations and values of all relative maxima and minima.

29) $f(x) = 2x^3 + 3x^2 - 12x + 5$

30) $g(x) = \frac{\ln x}{2x^2}, x > 0$

Find the second derivative of each function.

31) $f(x) = 9x^3 + \frac{2}{x}$

32) $g(x) = \frac{1-2x}{4x+3}$

- 33) Find $f''(2)$ and $f''(5)$ if $f(x) = 2x^2 - 5x^3 + \frac{1}{x^2}$

Find intervals where each function would be concave upward? Downward?

34) $f(x) = \frac{6}{x^2+3}$

35) $y = x^4 + x^3 - 3x^2 + 1$

36) Find any point(s) of inflection for the function $f(x) = x^3 - 9x^2 + 24x - 18$.