

Please complete all problems in the packet and show all work. You may use your graphing calculator when asked to do so. Otherwise, the problems should be completed without the help of your calculator. Bring your finished packet to class on the first day of school. I will take questions on the packet the first day of class. All of the information in this packet will be used throughout the year and you should be confident in each topic so that you are not lost as we move forward!

**Limits:** Evaluate the following limits (for 1-8 do NOT use L'Hopital's rule, for 9-13 you may use L'Hopital's rule).

**Evaluate each limit.**

$$1) \lim_{x \rightarrow \infty} \frac{-x - 1}{2x^2 + 2x + 1}$$

$$2) \lim_{x \rightarrow \infty} 4e^{\frac{1}{x}}$$

$$3) \lim_{x \rightarrow -\infty} (e^{2x} + 1)$$

$$4) \lim_{x \rightarrow -\infty} (-x^3 - 3x^2 + 7)$$

$$5) \lim_{x \rightarrow \infty} (-x^3 + x^2 - 1)$$

$$6) \lim_{x \rightarrow \infty} -\frac{x^2}{2x + 1}$$

$$7) \lim_{x \rightarrow \infty} (e^{4x} + 1)$$

$$8) \lim_{x \rightarrow \infty} \frac{x}{\sin(x)}$$

**Evaluate each limit using L'Hôpital's Rule.**

$$9) \lim_{x \rightarrow 1} \frac{4(x^2 - 1)}{\ln x^2}$$

$$10) \lim_{x \rightarrow 0} \frac{1 - \cos(x)}{\cos(2x) - 1}$$

$$11) \lim_{x \rightarrow 0} \frac{e^{3x} - 1}{x}$$

$$12) \lim_{x \rightarrow 0^+} 4x \ln \frac{1}{x}$$

$$13) \lim_{x \rightarrow 0} (2x + 1)^{\frac{1}{x}}$$

**Polynomial Long Division:**

We will use this in various parts of the course. So look up some videos on this if it is not something you feel great about. Use polynomial long division to divide the polynomials.

$$14. \frac{x^2 + 5x + 3}{x + 6}$$

$$15. \frac{50x^3 + 10x^2 - 35x - 7}{5x - 4}$$

### **Integration**

16.  $f(x) = \sqrt{9 - x^2}$ . What is the graph of  $f(x)$ ? Sketch  $\int_{-3}^3 f(x) dx$ . Use an appropriate formula from geometry to find the exact value of this integral. Show work.

17.  $f(x) = x^2 - 5$ . What is the graph of  $f(x)$ ? Sketch  $\int_0^4 f(x) dx$ . What does this integral represent? Be very specific. Use MATH 9 to evaluate this integral.

### **Area Between Curves**

In #18 and 19, show integral(s) needed to find the area between  $f$  and  $g$ . Use your graphing calculator to evaluate the area.

18.  $f(x) = e^x$ ;  $g(x) = x + 3$ .

19.  $f(x) = x^3 - x^2 - 2x$ ;  $g(x) = x$ .

20. Reverse the roles of  $x$  and  $y$  (i.e. integrate with “ $dy$ ”) to find the area bounded by  $x = y^2$  and  $y = -x + 6$ . Do not use your graphing calculator for any reason.

## Volume by Rotation

For #21 and 20, show the integral(s) needed to find the volume and then evaluate using your calculator.

21. Find volume generated by revolving the region bounded by  $f(x) = e^x$ ,  $g(x) = 5x + 1$ , and  $x = 2$  around the  $x$ -axis.

22. Find the volume of the solid generated by revolving the region bounded by  $y = x^3$ ,  $y = 0$ , and  $x = 2$  about:  
(a) the  $x$ -axis (b) the  $y$ -axis

(c) the line  $x = 4$

(d) the line  $y = 8$

## Properties of Integrals

Let  $\int_3^4 f(x) dx = -5$ ,  $\int_4^9 f(x) dx = 7$  and  $\int_2^6 g(x) dx = 9$

*Find:*

23.  $\int_5^5 f(x) dx$

24.  $\int_4^3 f(x) dx$

25.  $\int_3^9 f(x) dx$

26.  $\int_2^6 5g(x) dx$

27. The average value of  $g(x)$  on  $[2, 6]$

## Antiderivatives

*Find:*

28.  $\int (2x^3 + 5) dx$

29.  $\int (x^{-4} + \sqrt{x}) dx$

30.  $\int \sec^2 x dx$

31.  $\int 4 \tan x \sec x dx$

32.  $\int e^x dx$

33.  $\int \frac{5}{x} dx$

## Definite Integrals

*Evaluate. Show work.*

$$34. \int_3^5 (5x-1) dx$$

$$35. \int_{-\pi/2}^{\pi/2} \cos x dx$$

## Integration by Substitution

*Find each.*

$$36. \int (x+1)(x^2+2x)^5 dx, \text{ let } u = x^2 + 2x$$

$$37. \int e^{2x-1} dx$$

$$38. \int \frac{3x^2}{\sqrt{x^3+1}} dx$$

$$39. \int 6x \cos(5x^2) dx$$

$$40. \int \frac{(\ln x)^2}{x} dx$$

$$41. \int_1^5 (2x+3)^9 dx$$