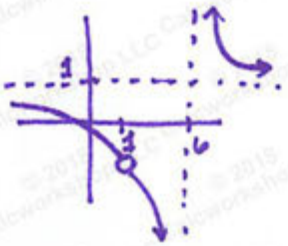
Key

Are you Ready for Calculus 3 (Multivariable Calculus)?

1. Find all of the discontinuities of f(x), and identify the type of discontinuity.

$$f(x)=\frac{x^2-1}{x^2-7x+6}$$

Removable Discontinuity: $x=1$ (jump discontinuity)



Infinite Discontinuity: $x=6$ ← vertical asymptote
$y=1$ ← horizontal asymptote

For #2-6, evaluate the limit

2. $\lim_{n\to\infty}\frac{3n^3-5n}{1-2n^2+n^3} = 3$

3. $\lim_{x\to 0}\frac{(x-5)^2-25}{x} = -10$

4. $\lim_{x\to 0}\frac{e^{3x}-e^{5x}}{x} = -2$

5. $\lim_{h\to 0}\frac{\sqrt{5+h}-\sqrt{5}}{h} = \frac{1}{2\sqrt{5}}$

6. $\lim_{x\to 0}\frac{\sin 3x}{3x^2+6x} = \frac{1}{2}$

For #7-9, find the derivative

7. $y = e^{2x} - \ln x^2 + \cos^2 4x$

$\frac{dy}{dx} = 2e^{2x} - \frac{2}{x} - 4\sin 8x$

8. $y = x^3e^{2x} - \sec 5x$

$\frac{dy}{dx} = 2x^3e^{2x} + 3x^2e^{2x} - 5\sec 5x\tan 5x$

9. $y = \ln(\sin 2x)$

$\frac{dy}{dx} = 2\cot 2x$

10. Find the local and absolute extrema for $f(x)=2x^3+9x^2+12x-1$ on $[-3,2]$.

Absolute minimum: $(-3,-10)$
Absolute maximum: $(2,75)$
Local minimum: $(-1,-6)$
Local maximum: $(-2,-5)$

For #11-14, evaluate the integral

11. $\int (\cos 2x) e^{\sin 2x} dx$

$\frac{1}{2} e^{\sin 2x} + C$

12. $\int_1^2 (xe^{6x}) dx$

$\frac{11e^{12} - 5e^6}{36}$

13. $\int \frac{x+2}{x^2+4x+9} dx$

$\frac{1}{2} \ln|x^2+4x+9| + C$

14. $\int_1^3 \left(\frac{x^2-1}{x+1}\right) dx$

2

15. The function f is continuous on the closed interval [2,8] and has values that are given in the table. Using three subintervals, approximate the right endpoint, left endpoint, and trapezoid approximation of $\int_2^8 f(x)dx$?

x	2	5	7	8
f(x)	10	30	40	20

Right: $3(f(5)) + 2(f(7)) + 1(f(8)) = 190$

Left: $3(f(2)) + 2(f(5)) + 1(f(7)) = 130$

Trapezoid: $\frac{1}{2}(3)(f(2)+f(5)) + \frac{1}{2}(2)(f(5)+f(7)) + \frac{1}{2}(1)(f(7)+f(8)) = 160$

16. Find the area of the region between the graphs of $y = \sin^2 x$ and $y = -x$ from $x = 0$ to $x = 2$

$A = 3 - \frac{1}{4}\sin 4$

17. The length of the curve $y = x^3$ from (0,0) to (1,1)

$L = 1.548$

18. If the region enclosed by the y-axis, the line y=2, and the curve $y = \sqrt{x}$ is revolved about the y-axis, find the volume of the solid generated.

$V = \frac{32\pi}{5}$

19. Identify the Conic Section

(a) $x^2+y^2-2x+6y+9=0$

Circle

(b) $x^2-25y^2-14x+100y-76=0$

Hyperbola

(c) $3(y-2)=2(x-15)$

line

(d) $x^2+36y^2-16x-72y+64=0$

Ellipse

(e) $x^2+4x-8y+12=0$

Parabola

20. Change from Rectangular form to Polar form

(a) $xy=-4$

$r^2 = -4\csc\theta\sec\theta$

(b) $x^2+y^2-3x=10y$

$r = 3\cos\theta + 10\sin\theta$

21. Change from Polar form to Rectangular form

(a) $r=4\csc\theta$

$y = 4$

(b) $r=6\cos\theta-2\sin\theta$

$x^2+y^2 = 6x-2y$

22. Eliminate the parameter t and write the equation in rectangular form

(a) $x=2t^2+3,\ y=t-1$

$x = 2y^2+4y+5$

(b) $x=3\cos t,\ y=3\sin t$

$x^2+y^2 = 9$