1. $\lim_{x \to 4} \dfrac{x^2+2x-15}{x^2-4x-12}$

3*. $\lim_{H \to \infty} \dfrac{5H^3+7H^2+21H+2}{100-200H+360H^2-3H^3}$

2* Find y' if $y = 13x^{13} + 8/x^3 + (x^2+1)^4 + 3\pi^9$

4. $\lim_{x \to 3^-} \dfrac{x^2-9}{x^2-x-6}$

6 $\lim_{x \to 5^-} \dfrac{x^3-3x^2+2x}{x^2+5x-50}$

5. Find eq of tan line to $y = \dfrac{3x^2+4}{x^2-4}$ at $x = 5$

7* The function $s = (t+t^3)^7 (3t^2+t^{-2})^{21} / (3t+7)^3$ gives distance as a function of time t. Find the velocity as a function of time.

8* $\lim_{H \to \infty} \left(\sqrt{H+\sqrt{H}} - \sqrt{H} \right)$

9. For the function f(x) defined by $f(x) = \begin{cases} x^2 & \text{if } x < -1 \\ x+2 & \text{if } -1 < x < 2 \\ x^3-3 & \text{if } 2 \le x \end{cases}$

A. is f(x) cont at $x = -1$? Why or why not?

B. is f(x) cont at $x = 2$? why or why not?

10 A 30ft pole has a bright lamp at its top. A 6ft person is standing x ft away from the base of the pole. A. Write an equation for the length of the person's shadow y in terms of x.

B*. Suppose $x = 40 + 3t$, find $\frac{dy}{dt}$ at $t = 0$.

Calculus I Test I 28 JAN 90 By ______________________

Show ALL Work. Be careful with equal (=) signs.

1. $\lim\limits_{z \to 3} \dfrac{z^2+6z+9}{z^2+2z-8}$

2. $\lim\limits_{y \to 2} \dfrac{y^2-5y+6}{y^2+y-6}$

3. $\lim\limits_{w \to \infty} \dfrac{3w^2+4w-1000}{3000+w-6w^2}$

4. $\lim\limits_{u \to 2^-} \dfrac{u^2+2u^3}{u-2}$

5. The position of a moving body at time t is given by

$$s = 4t^3 + \frac{t^5}{5} + \frac{7}{t^7} + 4\pi^3$$

Find the body's velocity and acceleration.

6. Find $\dfrac{du}{dv}$ when $u = (v^2+7)^{100}(13+v^{-2})^{500}$

7. Use the quotient rule to find y' when $y = \frac{2x-7}{4-3x}$. SIMPLIFY.

8. Find an equation for the tangent line to the curve $f(x) = x^3 - 2x^2 + 7$ at $x = -2$.

9. For the function $f(x)$ defined by $f(x) = \begin{cases} (x-1)^2 & x \le 1 \\ x & 1 < x < 3 \\ 6-x & 3 < x \le 5 \\ \sqrt{x/5} & 5 < x \end{cases}$

A. is $f(x)$ cont at $x=1$? Why or why not?

B. is $f(x)$ cont at $x=3$? Why or why not?

C. is $f(x)$ cont at $x=5$? Why or why not?

10. Use the definition of $f'(x)$ $\left[\text{i.e. } f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}\right]$ to find $f'(x)$ for $f(x) = \sqrt{3x}$

Calculus I Test 2 19 FEB 90 name ______________________

Show ALL work. Be Careful with equal signs. Read problems carefully.

1. Find $f'(\omega)$ if $f(\omega) = \cos^2 \omega + \sin \omega^2 + \sin(\cos(\tan \omega))$

2. $y = \sec t^2$, $x = \tan^2 t$
Find $\frac{dy}{dx}$

3. $V = \frac{1}{3}\pi r^2 h$. Find $\frac{dV}{dt}$ when $r = 10$, $h = 6$
$\frac{dr}{dt} = -2$ and $\frac{dh}{dt} = 3$. Simplify

4. Find the equation of the normal line to $xy^3 + x^3y = -30$ at $(-1, 3)$.

5. Find all local min's & max's (valley bottoms & hilltops) to $f(x) = \frac{x}{1+x^2}$.
On which intervals is $f(x)$ increasing? On which intervals is $f(x)$ decreasing?

6. Newton's method is to be used to approximate the roots of $f(x)$.
$f(x) = x^2 - 30x + 224 = (x-15)^2 - 1$ has roots on either side of $x = 15$.
Write down and simplify the equation for x_{n+1} (the $n+1^{st}$ approximation) in terms of x_n (the n^{th} approximation).

7. Find the points of inflection and the intervals where f(x) is concave up (smiling) and concave down (frowning) when $f(x) = 2x^6 - 3x^5 - 30x^4 + 1000x - 2400$.

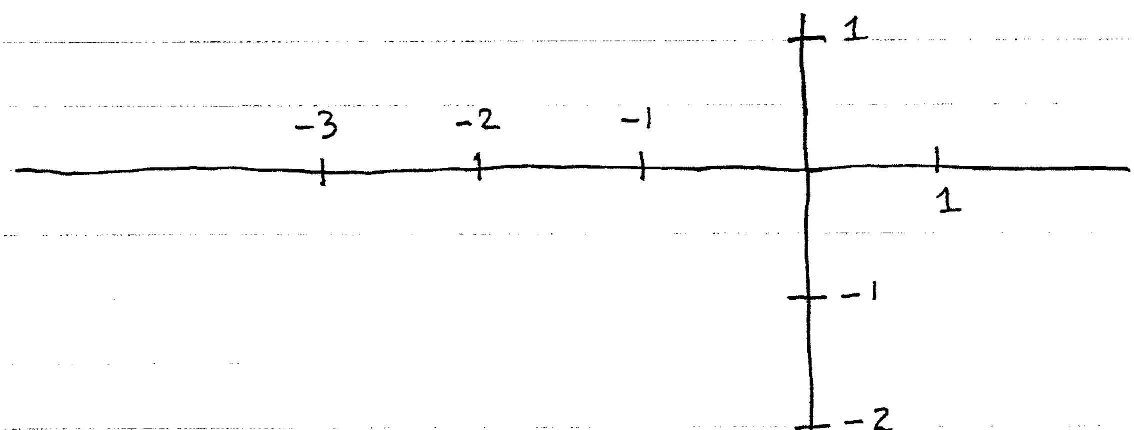
8. Implicitly, find and solve for y' and y'', in terms of x and y alone, if $\cos x \sin y = \pi/4$
[Hint y' simplifies]

9. Graph the continuous function f(x) given the info below. (funny points are −3, −2, −1, 0, 1)
und means undefined.

$\lim_{x\to\infty} f(x) = +\infty$

$\lim_{x\to-\infty} f(x) = +\infty$

x	$-3\frac{1}{2}$	-3	$-2\frac{1}{2}$	-2	$-1\frac{1}{2}$	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1	$1\frac{1}{2}$
$f(x)$	?	−2	?	−1	?	0	?	1	?	0	?
$f'(x)$	−	0	+	3	+	0	+	und	−	0	+
$f''(x)$	+	+	+	0	−	0	+	und	+	+	+



10. Using the differential approximate how accurately (in percent) you should measure the radius of a circle to be sure of calculating the area within 8%. Show ALL work.

CAL I TEST 3 12 MAR 90 by ______________________

Show ALL Work. Be careful with equal signs. Read the problems CAREFULLY

1. $\lim\limits_{x \to 0^+} \dfrac{\sin 2x}{\sin 3x} =$

2. $\displaystyle\int 6x^5 + \frac{x^7}{7} + \sqrt{2x} + \frac{1}{x^3} + \pi \, dx =$

3. $\displaystyle\int \frac{t^2 \, dt}{\sqrt{3t^3 + 20}} =$

4. Find $f(t)$ if $f''(t) = 5(t-7)^3$, $f'(9) = 36$ and $f(7) = 10$

5. Find the equation of the tangent line to $y\cos 2x - x\sin 2y = \pi/4$ at $(\pi/6, \pi/2)$. Simplify.

6. For $f(x) = \sqrt{x-1}$ $a = 1$, $b = 3$ find all c's which will make the MVT (Mean Value Theorem) true.

7. Find the minimum and maximum <u>VALUES</u> of $f(x) = 2x^3 - 15x^2 + 24x$ on $[3, 5]$

8. Find the minimum and maximum <u>VALUES</u> of $g(z) = \frac{z}{1+z^2}$ on $(0, 3)$

9. A 13 foot ladder is leaning against a wall. The foot of the ladder is moving towards the wall at 3ft/sec. How fast is the top of the ladder rising when the top of the ladder is 12 ft above the ground? (Assume the wall and the ground are perpendicular.)

10. Find the <u>dimensions</u> of the rectangle of maximum area which can be constructed using 4 miles of fence for <u>THREE</u> of the four sides. (The fourth side isn't fenced.)

CAL I TEST 4 16APR90 by ____________

Show ALL Work. Be careful with equal signs. Read the problems CAREFULLY.

1. $\int \tan t \sec t + \cos 2t + \sec^2 \frac{t}{3} + 2t \sin t^2 \, dt =$

2. $\int_{\pi/4}^{\pi/3} \cos^2 t \, dt =$

3. $\int_{-3}^{-2} (2x-3)\sqrt{x+3} \, dx =$

4. Find $F'(x)$, if $F(x) = \int_1^{2x} \sqrt{1+t^3} \, dt$.

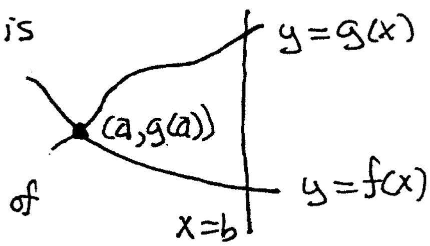
5. Find the area between $y = 2x - x^2$ and the x-axis.

6. A thin rod has density function $\delta(x) = (4-x)x^2$ for $0 \le x \le 4$. Find the mass and center of mass of the rod.

7. The parametric equations to right are those of a spiral. Write an integral which is the arclength of this spiral. Simplify the integrand, but do NOT evaluate the $\int$.

$$\begin{cases} x = t\cos t \\ y = t\sin t \end{cases} \quad \pi \le t \le 5\pi$$

8. The region S is pictured to the right. It is the area between $y=f(x)$, $y=g(x)$ and $x=b$. For parts A & B write an Integral (but do NOT evaluate it) which is the volume of the solid of revolution given by rotating S about the given axis.



A. The x-axis

B. the y-axis

9. The line $15y-3x+18=0$ and the curve $x=y^4$ intersect at $(1,-1)$ and $(16,2)$. Find the area between the line and the curve.

10. The error estimate for the trapezoidal rule is $|E_T| \le \frac{b-a}{12}h^2M$, where M is the maximum value of $|f''|$ on $[a,b]$. Give the minimum number of subdivisions "n" which are need to approximate $\int_2^3 x^4\,dx$ with an error less than 10^{-4} using this error estimate.

Calculus I FINAL 26 April 90 by ____________

Show ALL work. Be careful with equal signs. Read problems carefully.

1. $\lim\limits_{x \to 3^-} \dfrac{x^2 + x - 6}{x^2 - x - 12} =$

2. $\lim\limits_{x \to 7} \dfrac{x^3 - 6x^2 - 7x}{x^2 - 49} =$

3. $x = t\cos t$, $y = t\sin t$, find $\frac{dy}{dx}$.

4. $z = \dfrac{w+2}{w-3}$, find z', simplify.

5. $F(x) = \displaystyle\int_{10}^{3x} \sin t^2\, dt$, find $F'(x)$.

6. $\lim\limits_{x \to 0} \dfrac{\sqrt{2-x} - \sqrt{2}}{3x} =$

7. Find y', if $x^2 + 3xy + y^3 = 1$, simplify.

8. $\displaystyle\int_{\pi/4}^{\pi/3} \sin^3 t\, dt =$

9. $\displaystyle\int_{1}^{\sqrt{10}} x\sqrt{x^2-1}\, dx =$

10. Find $\frac{du}{dv}$ if $u = (7v + \tan v)^{10}(1 + \sin 2v)^{-7}$

11. Find the equation of the tangent line to $f(x) = x^3 - 4x + \frac{1}{x^2}$ at $x=2$. Simplify.

12. Suppose $f(x)$ and $g(x)$ are two functions so that $f'(x) = g'(x)$ for every x. Suppose further that $f(0) = 1$, $f(4) = 10$ and $g(0) = 7$.

Find $g(4) =$

13. Find the minimum and maximum values of $f(x) = 3x^4 + 8x^3 + 6x^2 + 1$ on $[0, 2]$.

14. Find the area in the first quadrant between $y = x^2$, $y + x - 2 = 0$ and the x-axis.

15. A triangular plate ABC is submerged in water ($\omega = 62.5\ \text{lb/ft}^3$) with its plane vertical. The side AB, 6 ft long, is a surface level, while C is 5 ft below AB. Find the total force on one face of the plane.

16. The error estimate for Simpson's rule is $|E_S| \le \frac{b-a}{180} h^4 M$, where M is the maximum value of $|f''''|$ on $[a, b]$. Give the minimum number of subdivisions "n" which are needed to approximate $\int_2^3 \frac{x^5}{2} dx$ with an error less than 10^{-4}.

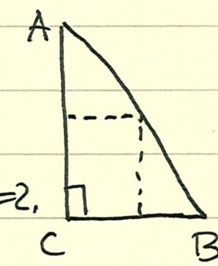
17. The Region S' is the area between $y=x$, $y=2x$, $x=1$ and $x=2$. Find the Volume of the solid of revolution given by rotating S' about the given axis.

A. The x-axis

B. The y-axis

18. The radius of a sphere is increasing at the rate of 5 meters/sec. How fast is the volume increasing when the volume is $\frac{9}{2}\pi$ cubic meters?

19. Find the dimensions of the rectangle of maximum area which can be incribed in the right triangle ABC, $BC=1$ and $AC=2$.



20. Graph $f(x)=\frac{x}{1+x^2}$. Indicate local min/max's, points of inflection & asymptotes.