

Name: ANSWERS

Instructions: Answer all problems in the space provided! No calculators! Use your own scrap paper.

1. State the following rules (as equations); using  $f$  and  $g$  (functions of  $x$ ) to illustrate:

Writing the entire equation including the "d" is important

- (a) The product rule:  $\frac{d}{dx}(fg) = f'g + fg'$  (b) The power rule:  $\frac{d}{dx}(x^n) = nx^{n-1}$   
 (c) The quotient rule:  $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$  (d) The chain rule:  $\frac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x)$   
 (e)  $\frac{d}{dx}e^u = u'e^u$  (f)  $\frac{d}{dx}\tan^{-1}x = \frac{1}{1+x^2}$

2. Compute the limits:

- (a)  $\lim_{x \rightarrow 2} \frac{x^3 - 4x}{2-x} = -8$  (b)  $\lim_{x \rightarrow \infty} \frac{2x^3 - 5x + 1}{4 - 3x^3} = -2/3$  (c)  $\lim_{x \rightarrow 0} \frac{x \cos 3x}{\sin 4x} = 1/4$

3. Differentiate:

- (a)  $y = \frac{5x^2 + \sin x}{\pi} = \frac{10x + \cos x}{\pi}$  (b)  $y = \ln \frac{2x}{\sqrt{x+8}} = \frac{1}{x} - \frac{1}{2(x+8)}$   
 (c)  $y = 4x^5(2x+1)^7 = 4x^4(2x+1)^6(24x+5) \rightarrow 20x^4(2x+1)^7 + 28x^5(2x+1)^6(2)$   
 is acceptable.

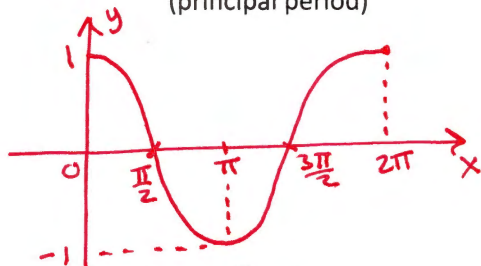
4. Integrate:

Will lose the point if the "+C" is not written

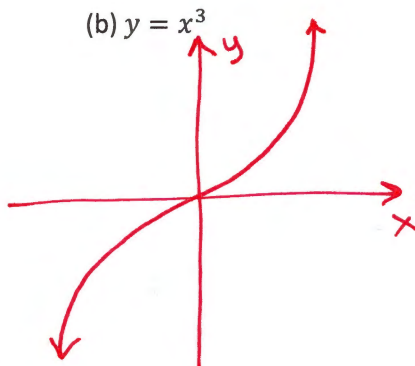
- (a)  $\int \frac{4x^2 - 4x + 1}{x^{3/2}} dx = \frac{8}{3}x^{3/2} - 8x^{1/2} - 2x^{-1/2} + C$  (b)  $\int \sin(\cos x) \sin x dx = \cos(\cos x) + C$   
 (c)  $\int x \sin(x^2) dx = -\frac{1}{2} \cos x^2 + C$  (d)  $\int \frac{1}{x \ln x} dx = \ln |\ln x| + C$

5. Sketch the following functions (do a mini sketch under the function's name, label intercepts):

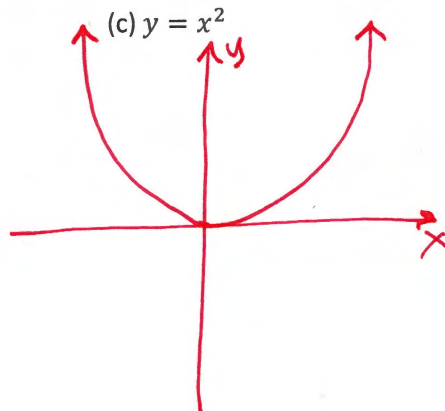
(a)  $y = \cos x$   
(principal period)



(b)  $y = x^3$



(c)  $y = x^2$



(d)  $y = x^3 - 4x$

