

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/dx" part 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.

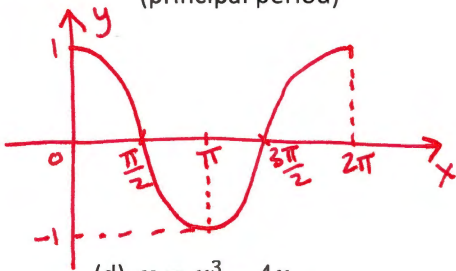
4. Integrate:

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

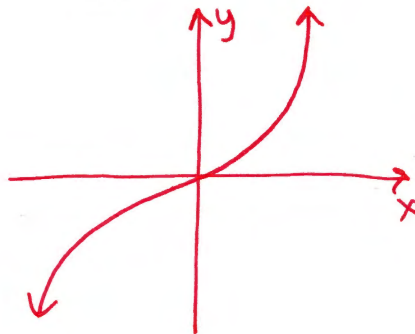
- (a) $\int \frac{4x^2 - 4x + 1}{x^{3/2}} dx = \frac{8}{3}X^{3/2} - 8X^{1/2} - 2X^{-1/2} + C$ (b) $\int \sin(\cos x) \sin x dx = \cos(\cos x) + C$
 (c) $\int x \sin(x^2) dx = -\frac{1}{2} \cos X^2 + C$ (d) $\int \frac{1}{x \ln x} dx = \ln |\ln x| + C$

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

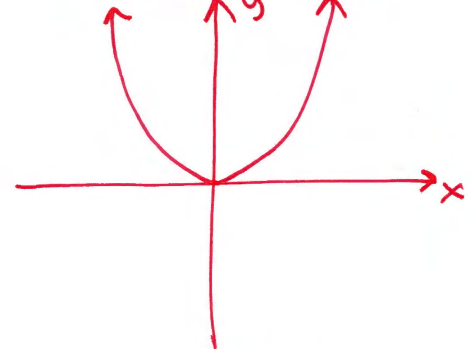
(a) $y = \cos x$
(principal period)



(b) $y = x^3$



(c) $y = x^2$



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

