

Math 241
Summer 2018
Exam 1 - Practice
7/13/15
Time Limit: 50 Minutes

Name (Print): _____

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
6	15	
7	15	
8	15	
Total:	145	

1. (20 points) Find the following limits:

a) $\lim_{x \rightarrow 2} \frac{(x^2 - 4)(x + 2)}{(x^2 - 5x + 6)(x + 1)}$

b) $\lim_{x \rightarrow 0} \frac{\tan(2x)}{3x}$

c) $\lim_{x \rightarrow 1} \frac{\sqrt{x + 8} - 3}{x - 1}$

d) $\lim_{x \rightarrow 1^-} \frac{\sqrt{3x}|x - 1|}{(x - 1)}$

2. (20 points) Find the following limits:

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

b) $\lim_{x \rightarrow \infty} \frac{2 \sin(x)}{x^2 + 1}$

c) $\lim_{x \rightarrow 2^-} \frac{x^2 - 10}{x^2 - 4}$

d) $\lim_{x \rightarrow \infty} \frac{(x^{5/3} - 10)\sqrt[3]{x}}{2x^2 + x - 4}$

3. (20 points) a) State the Intermediate Value Theorem.

b) Use the Intermediate Value Theorem to show that the equation $\sin(x) + x = 1$ has a solution.

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4. (20 points) Use the **definition of the derivative as a limit** to find $f'(x)$ if $f(x) = \frac{1}{x+1}$.
Note: using derivative rules will get no points!

5. Find the following derivatives: (warning! no partial credit)

(a) (5 points) $f(x) = \sqrt{x} + 7x + \frac{1}{x}$

(b) (5 points) $g(x) = \tan(x)\sqrt{x^2 + 1}$

(c) (5 points) $h(x) = \frac{3 \sec(2x)}{\frac{1}{x^2} + x}$

(d) (5 points) $k(x) = \sin(1 + \sqrt{x^2 + 2})$

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6. (15 points) Given $x^2 + y^3 = xy^2$, find $\frac{dy}{dx}$. note: Be prepared to give back the equations of the normal and tangent lines at a particular point on the actual exam.

7. (15 points) Given the position function $p(t) = \sin(t) + t^2 + t + 2$ (in feet where t is in seconds), find the velocity function $v(t)$, and the acceleration function $a(t)$. What is the object's initial velocity (a.k.a. $v'(0)$)? What is the object's acceleration at $t = 2\pi$?

8. (15 points) Batman is particular about kites. He ONLY flies a kite at a height of exactly 300ft. , always. Today is no different. Also, today, the wind pushes the kite and it moves horizontally in the air at a rate $25\frac{\text{ft}}{\text{sec.}}$.

a) How fast must he be letting out string for the kite to remain at the constant height of 300ft. at the precise moment he has let 500 ft. of string out?

b) How fast is the angle between the string and the ground changing at this time?