

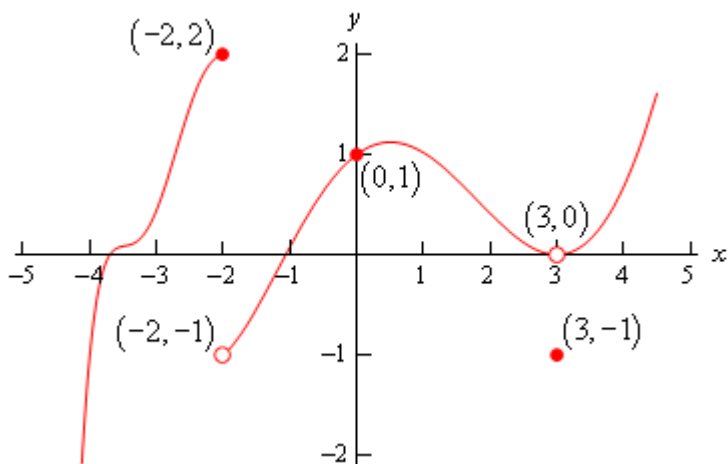
NAME: _____

MATH 181 FINAL EXAM SAMPLE

NOTE: The actual exam will only have 12 questions. The different parts of each question (part A, B, etc.) are variations. Know how to do all the variations on this exam.

1A/B.) (6 pts) Find the following by using the graph of $f(x)$ below. If it doesn't exist, write DNE.

NOTE: Problem 1 on the actual test will not have this many parts



a.) Find $f(-2)$ _____

b.) Find $f(3)$ _____

c.) Find $\lim_{x \rightarrow 3^+} f(x)$ _____

d.) Find $\lim_{x \rightarrow 3^-} f(x)$ _____

e.) Find $\lim_{x \rightarrow 3} f(x)$ _____

f.) Find $\lim_{x \rightarrow -2^+} f(x)$ _____

g.) Find $\lim_{x \rightarrow -2^-} f(x)$ _____

h.) Find $\lim_{x \rightarrow -2} f(x)$ _____

i.) Find $\lim_{x \rightarrow -1} f(x)$ _____

j.) At what value(s) is $f(x)$ discontinuous?

2A.) (6 pts) Evaluate the limit. If the limit does not exist, indicate DNE.

i.) $\lim_{x \rightarrow 0} \frac{\sqrt{4+x} - 2}{x}$

i. _____

$$\text{ii.) } \lim_{x \rightarrow \infty} \frac{7x^2 + \sqrt{2}}{14x^3 - 3x^2 + 5}$$

ii. _____

2B.) (6 pts) Evaluate the limit. If the limit does not exist, indicate DNE.

$$\text{i.) } \lim_{x \rightarrow 3} \frac{x^2 - 11x + 24}{x - 3}$$

i. _____

$$\text{ii.) } \lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 + 3x - 5}}{7 - 4x}$$

ii. _____

2C.) (6 pts) Evaluate the limit. If the limit does not exist, indicate DNE.

$$\text{i.) } \lim_{x \rightarrow 4} \frac{2x^2 - 9x + 4}{x - 2}$$

i. _____

ii.) $\lim_{x \rightarrow \infty} \frac{2x^2 + 3}{3 + 4x + 5x^2}$

ii. _____

3A.) (4 pts) Differentiate $y = \sqrt{x^5} - \csc x + \ln(4x)$

3A. _____

3B.) (4 pts) Differentiate $y = \frac{1}{\sqrt[3]{x^2}} + \cot x + e^{5x}$

3B. _____

4A.) (4 pts) Differentiate $f(x) = x^2 e^{3x}$

4A. _____

4B.) (4 pts) Differentiate $f(x) = x^2 \tan x$

4B. _____

4C.) (4 pts) Differentiate $f(x) = \frac{3x-5}{x+7}$

4C. _____

5A.) (4 pts) Use implicit differentiation to find $\frac{dy}{dx}$ for the curve
 $\cos(xy) = 1 + \sin y$

5A. _____

5B.) (4 pts) Use implicit differentiation to find $\frac{dy}{dx}$ for the curve
 $x^2(x^2 + y^2) = y^3$

5B. _____

5C.) (4 pts) Use implicit differentiation to find $\frac{dy}{dx}$ for the curve
 $e^y = xy$

5C. _____

6A. (5 pts) Differentiate: $y = 3(\sin(2x))^4$

6A. _____

6B. (5 pts) Differentiate: $y = 2e^{\cos(5x)}$

6B. _____

7A.) (6 pts) Find y'' (second derivative) if $y = \ln(x^2 + 5)^2$.

7A. _____

7B.) (6 pts) Find y'' (second derivative) if $y = \cos^4 x$.

7B. _____

8A.) (6 pts) Use $f(x) = 2x^4 - 16x^2$ to find the relative extrema and interval(s) of increasing and decreasing.

Increasing: _____

Decreasing: _____

Relative Max: _____

Relative Min: _____

8B.) (6 pts) Use $f(x) = x^{\frac{1}{3}}(x-8)$ to find the relative extrema and interval(s) of increasing and decreasing.

Increasing: _____

Decreasing: _____

Relative Max: _____

Relative Min: _____

9A.) (4 pts) Evaluate the integral: $\int \frac{1}{3\theta^2} - 2\sec\theta \tan\theta + e^{2\theta} - 4 \, d\theta$

9A. _____

9B.) (4 pts) Evaluate the integral: $\int \frac{1}{5 \cdot \sqrt[3]{\theta}} - 4\sec^2\theta + 3 \cdot 2^{3\theta} + 5 \, d\theta$

9B. _____

10A.) (4 pts) Evaluate the integral: $\int \frac{2x^3}{\sqrt{3+x^4}} \, dx$

10A. _____

10B.) (4 pts) Evaluate the integral: $\int \frac{3x^4}{7} \sin\left(\pi - \frac{x^5}{5}\right) dx$

10B. _____

10C.) (4 pts) Evaluate the integral: $\int \left(\frac{x^2 + 4x + 10}{x^3 + 6x^2 + 30x - 4} \right) dx$

10C. _____

10D.) (4 pts) Evaluate the integral: $\int \frac{2dx}{3x^{\frac{2}{3}} \left(1 + x^{\frac{1}{3}}\right)}$

10D. _____

11A.) (5 pts) Evaluate the definite integral: $\int_0^{\frac{\pi}{2}} \frac{40 \cos \theta}{(4 + \sin \theta)^2} d\theta$

11A. _____

11B.) (5 pts) Evaluate the definite integral: $\int_0^{\frac{\pi}{4}} \frac{e^{\tan \theta}}{\cos^2 \theta} d\theta$

11B. _____

11C.) (5 pts) Evaluate the definite integral: $\int_0^2 \theta^2 \sqrt{\theta^3 + 1} d\theta$

11C. _____

12.) (6 pts) The following problems deal with related rates or optimization. CHOOSE and SOLVE **ONE** of these problems. Indicate which one you want me to grade. (The actual test will have only 3 problems to choose from)

A.) The radius of a right circular cylinder is increasing at a rate of 5cm/min. If the height is always twice the radius, find the rate the volume is changing when the height is 8 cm.

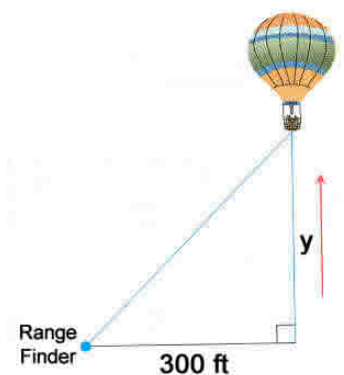
A. _____

B.) When a circular plate of metal is heated in an oven, its radius increases at a rate of 0.02 cm/min. At what rate is the plate's area increasing when the radius is 40 cm?

B. _____

C.) A hot air balloon is rising straight up from a level field is being tracked by a range finder 300 feet from the liftoff point. The diagonal distance between the range finder and the balloon is increasing at a rate of 16 feet per minute. Find that rate the balloon is rising when the balloon's height is 400 feet.

C. _____

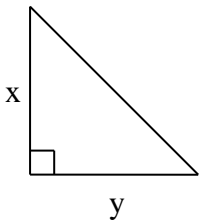


D.) A right triangle with a hypotenuse of 30 feet has its base increasing at a rate of 5 ft/sec. Find the rate the height is decreasing when the base is 18 ft.

D. _____

E.) What is the maximum area of a right triangle whose legs have a combined length of 10cm? Note: the legs are x and y . The area of this triangle is $A = \frac{1}{2}xy$.

E. _____

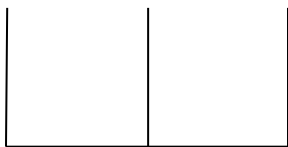


F.) The edges of a cube are expanding at a rate of 5 cm/sec. How fast is the Surface area changing when each edge is 4.5cm?

F. _____

G.) A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a river, so no fencing is needed along the river. The field will be divided as shown. What dimensions of the field produce the largest area?

G. _____



MATH 181 FINAL EXAM REVIEW PROBS

| <u>Section</u> | <u>Problems</u> |
|-----------------------|--|
| 2.2 | #1 – 4, 23 – 42 |
| 2.4 | #1, 2 |
| 2.5 | #13 – 22, 33 – 36 |
| 3.3 | #1 – 40 (first derivative only) |
| 3.5 | #1 – 32 |
| 3.6 | #23 – 46, 49, 51, 52, 61, 62, 73, 74 |
| 3.7 | #1 – 18 |
| 3.8 | #11 – 20, 55 |
| 3.10 | #11 – 14, 19 – 23, 26, 27, 30, 31, 41 |
| 4.3 | #19 – 44 (all parts), 45 – 62 (part a only) |
| 4.6 | #1, 2, 4 – 9, 11, 13, 14, 15, 16, 18, 20, 23 |
| 4.8 | #25 – 62 |
| 5.5 | #17 – 60 |
| 5.6 | #13 – 46 |

Test will be closed-book, however you will be allowed to bring a 3 by 5 notecard (both sides). The exam will consist of problems similar to the ones on this sample test and the above list of review problems. Only the sections indicated in this review sheet will appear on the final exam.