Math 75A Practice Midterm III
Ch. 6-8 (Ebersole), §§2.7-3.4 (Stewart)

DISCLAIMER. This collection of practice problems is *not* guaranteed to be identical, in length or content, to the actual exam. You may expect to see problems on the test that are not exactly like problems you have seen before.

On the actual exam you will see directions similar to these:

1. Please read directions carefully. Raise your hand if you are not sure what a problem is asking.
2. *You must explain your work thoroughly and unambiguously to receive full credit on questions or parts of questions designated as* ***Work and Answer****.*
3. **No calculators or notes are allowed on this exam.**
4. You have 65 minutes to complete your test, unless announced otherwise. Do not spend too long on any one problem. You do not have to do the problems in order. Do the easy ones first. Do not attempt the bonus question until you have completed the rest of the test. Before turning in your test, please make sure you have answered and double-checked all the questions.
5. If you need scratch paper, please raise your hand. You may not use your own paper. When you have finished your exam, please turn in any scratch paper you use.
6. Write your solutions in the space provided for each problem, or provide specific instructions as to where your work is to be found. *Make it clear what you want and don't want graded.* Your final answers should be boxed or circled.
7. Don't stress! I'm rooting for you!

True or False. Circle **T** if the statement is *always* true; otherwise circle **F**.

1. If $g(x) = 3x^4 \sin x$, then $g'(x) = 12x^3 \cos x$. **T** **F**
2. $\sec\theta \tan\theta = \dfrac{\sin\theta}{\cos^2\theta}$ for all angles θ. **T** **F**
3. $\sin(5t) = 5\sin t$ for all angles t. **T** **F**
4. $\tan\left(\dfrac{2\pi}{3}\right) = -\sqrt{3}$. **T** **F**
5. The only solution to the equation $\cos t = -1$ is $t = \pi$. **T** **F**

Multiple Choice. *Circle the letter of the best answer.*

1. If $H'(2) = \lim\limits_{h\to 0} \dfrac{\frac{3}{\sqrt[4]{2+h}} - \frac{3}{\sqrt[4]{2}}}{h}$, then $H(t)$ could be

   (a) $\dfrac{3}{\sqrt[4]{t}}$

   (b) $-\dfrac{3}{\sqrt[4]{t}}$

   (c) $-\dfrac{3}{\sqrt[4]{t^5}}$

   (d) $12\sqrt[4]{t^3}$

2. $\dfrac{3}{5(\sqrt[4]{x+2})^3} + \dfrac{x^2}{3} - \sqrt{5x} =$

(a) $\frac{3}{5}(x+2)^{-3/4} + \frac{1}{3}x^{-2} - 5x^{1/2}$

(b) $\frac{3}{5}(x+2)^{-3/4} + \frac{1}{3}x^{2} - \sqrt{5}x$

(c) $\frac{3}{5}(x+2)^{-3/4} + \frac{1}{3}x^{2} - \sqrt{5}x^{1/2}$

(d) $\frac{3}{5}(x+2)^{-4/3} + \frac{1}{3}x^{2} - \sqrt{5}x^{1/2}$

Use the following information to answer questions 3 and 4. Let $A(t)$ be the concentration of a certain drug in a patient's bloodstream, measured in g/m^3, t minutes after injection. Suppose $A'(30) = 2.4$ and $A'(90) = -1.3$.

3. $A'(30) = 2.4$ means

(a) After 30 minutes, the concentration of the drug in the patient's bloodstream is 2.4 g/m^3

(b) During the first 30 minutes after being injected, the concentration of the drug in the patient's bloodstream increased by an average of 2.4 g/m^3 per minute

(c) After 30 minutes, the concentration of the drug in the patient's bloodstream is increasing at a rate of 2.4 g/m^3 per minute

(d) After 2.4 minutes, the concentration of the drug in the patient's bloodstream has risen by 30 g/m^3

4. $A'(90)$ is a negative number, which means

(a) After 90 minutes, there is a negative amount of the drug in the patient's bloodstream

(b) After 90 minutes, the concentration of the drug in the patient's bloodstream is decreasing

(c) 1.3 minutes before the injection, the concentration of the drug in the patient's bloodstream was 90 g/m^3

(d) There is a mistake; $A'(90)$ cannot be a negative number

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5. If $f(x) = 4x^7 - \dfrac{x^2}{5} + 2$, then $f'(x) =$

(a) $28x^5 - \frac{2}{5}x$

(b) $28x^6 - \frac{2}{5}x$

(c) $4x^7 - \frac{1}{5}x^2 + 2$

(d) $28x^6 - \frac{1}{5}x + 2$

6. If $g(x) = 6\sqrt[3]{x}$, then $g'(x) =$

(a) $\dfrac{2}{x^{2/3}}$

(b) $\dfrac{6}{x^{-1/3}}$

(c) $6\sqrt[3]{1}$

(d) $\dfrac{2}{\sqrt[3]{x}}$

7. If $f(x) = \tan x$, then $f'(x) =$

(a) $\sec^2 x$

(b) $\dfrac{\sin x}{\cos x}$

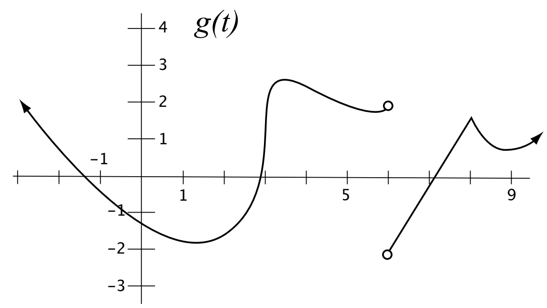
(c) $\dfrac{1}{\tan x}$

(d) $\sec x \tan x$

Fill-In.

1. For the graph of $g(t)$ shown at right, the value(s) of t at which $g'(t)$ is undefined is/are

______________________________ .



2. $\sin\left(-\dfrac{3\pi}{2}\right) =$ _______________

3. $\cos\left(\dfrac{3\pi}{4}\right) =$ _______________

4. $\tan\left(\dfrac{11\pi}{6}\right) =$ _______________

5. $\sec\left(\dfrac{17\pi}{3}\right) =$ _______________

6. If $\cos\theta = -\dfrac{1}{5}$ and θ is in quadrant II, then

   (a) $\sin\theta =$ _______________

   (b) $\tan\theta =$ _______________

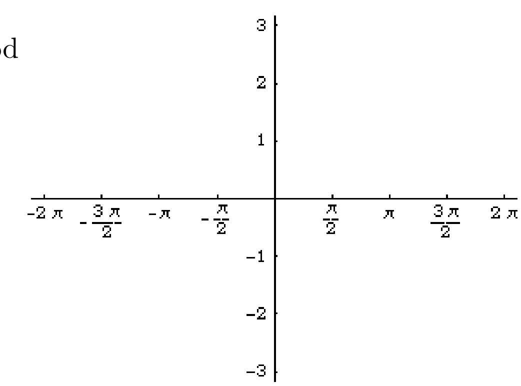
   (c) $\sec\theta =$ _______________

   (d) $\csc\theta =$ _______________

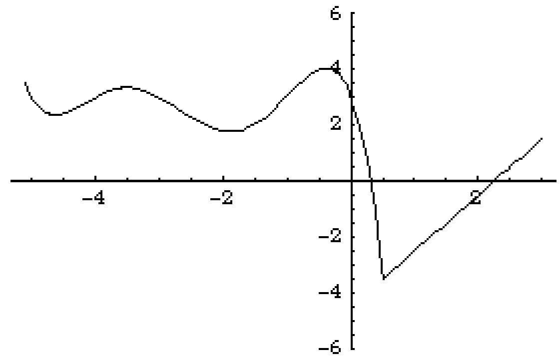
   (e) $\cot\theta =$ _______________

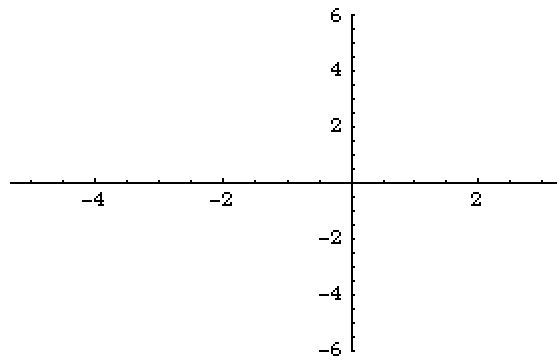
Graphs. *More accuracy = more points!*

1. On the axes at right, sketch a graph of at least one period of the function $f(t) = \dfrac{3}{2}\sin(2t - \pi)$.



2. For the graph of $f(x)$ shown at right, sketch a graph of $f'(x)$ on the axes below it.





Work and Answer. *You must show all relevant work to receive full credit.*

1. If a stone is thrown vertically upward from the surface of the moon with a velocity of 10 m/s, then its height (in meters) after t seconds is $s(t) = 10t - 0.83t^2$.

   (a) What is the velocity of the stone after 3 seconds?

   (b) When does the stone reach its maximum height?

2. For the function $g(x) = \dfrac{2}{x-1}$, compute $g'(-1)$.

   No shortcuts are allowed!

3. Find the value(s) of x at which the tangent line to the graph of $f(x) = 3x^2e^x$ is horizontal.

4. If $g(x) = \dfrac{3x-5}{e^x}$, find $g'(2)$.

5. Find the equation of the tangent line to the graph of $h(x) = \sqrt{5x} + 1$ at $x = 4$.

Some kind of **BONUS.**