Midterm 3 Review Problems **Math 141**

These are suggested review problems similar to what might be on Midterm 3. Included with each problem is a link to a video where you can see how the problem is solved. I didn't make the videos, they are all available on YouTube.

1. Find the intervals of increase and decrease for the function $f(x) = \dfrac{x}{1+x^2}$.

https://youtu.be/oThEqQVHo9c

2. Find the intervals of concavity and inflection points for $f(x) = 6x^5 + x^4 - 5x - 6$.

https://youtu.be/kivhvloJS7w

3. Find the following limits.

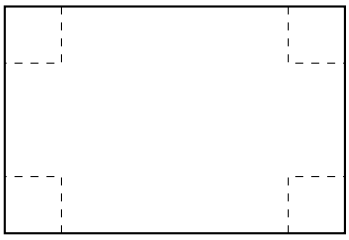
   (a) $\lim\limits_{x\to-\infty} \dfrac{5x - 7x^3}{2x^2 + 14x^3 - 9}$.

https://youtu.be/NmLljBAg82o?t=465

   (b) $\lim\limits_{x\to 0} \dfrac{\sin(7x)}{\sin(4x)}$.

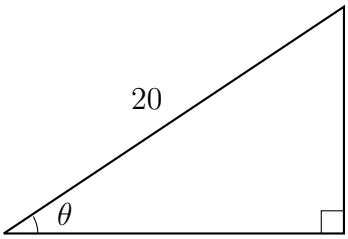
https://youtu.be/C-aFwHreB0U

4. A rectangular piece of cardboard is 20 inches by 30 inches. If we cut a square from each corner of the cardboard and fold up the sides to make a box, how big should the squares be in order to maximize the volume?



https://youtu.be/cRboY08YG8g

5. The hypotenuse of a right triangle is 20 centimeters long. Find the value of the angle θ that maximizes the perimeter of the triangle.



https://youtu.be/JjNpkQ_5tsY

6. Find $G(x)$ for $x > 0$, given that $G''(x) = 6x + \frac{5}{x^2}$, $G'(1) = 2$ and $G(1) = 3$. This problem has a natural logarithm in the solution which we haven't talked about. You can skip it.

https://youtu.be/n1fHUjHIgnk

7. Calculate the following definite integrals.

(a) $\int_{-3}^{5} 4\,dx$.

https://youtu.be/auOcNZFKfo0

(b) $\int_{\frac{11\pi}{2}}^{6\pi} 9\sin(x)\,dx$.

https://youtu.be/ldLdWj6DLTw

8. Find all antiderivatives of the following functions.

(a) $F'(x) = \frac{2}{3}x^{4/7}$.

https://youtu.be/n0PeFRNAZ9c

(b) $f(x) = \dfrac{x^4 - 2}{x^2}$.

https://youtu.be/PJFdN3E3mmo