Midterm 2 Review Problems **Math 142**

These are suggested review problems similar to what might be on Midterm 2. 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 online.

1. Use Euler's method with $\Delta x = \frac{1}{2}$ to approximate $y(1)$ for the differential equation $\dfrac{dy}{dx} = y$ with initial condition $y(0) = 1$.

https://youtu.be/q87L9R9v274

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2. Use integration by parts to compute $\displaystyle\int_1^2 \frac{\ln x}{x^2}\,dx$.

https://youtu.be/zGGI4PkHzhI

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3. Evaluate $\displaystyle\int x^2 \sin(3x)\,dx$.

https://youtu.be/2I-_SV8cwsw

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4. Evaluate $\displaystyle\int \frac{1}{(1+x^2)^{5/2}}\,dx$ using a trig substitution.

https://youtu.be/7nWDBemtZTk

5. Find $\displaystyle\int \frac{x^2 - 3x - 5}{x - 2}\, dx.$

https://youtu.be/02wswP8RED8

6. Evaluate $\displaystyle\int \frac{3x - 8}{x^2 - 4x - 5}\, dx.$

https://youtu.be/HZTv4zCgEnA

7. Find $\displaystyle\int \sec^3 x \, \tan^3 x \, dx.$

https://youtu.be/Yv6AYLm_aSc

8. Compute $\displaystyle\int \sin^5 x \, dx.$

https://youtu.be/w__RvsAO1BQ

9. Find $\int \cos^2(2x)\,dx$.

https://youtu.be/u2UcZLqYfqM

10. Compute $\lim_{x\to 1}\left(\frac{x}{x-1}-\frac{1}{x}\right)$.

https://youtu.be/VbHKHlTHJcY

11. Evaluate $\lim_{x\to 0^+}(e^x+5x)^{1/x}$.

https://youtu.be/NYDj946krG0

12. Compute $\int_0^\infty \frac{1}{(x+1)^{3/2}}\,dx$.

https://youtu.be/45YcoKNRa-Y

13. Show that the integral $\int_1^\infty \frac{x+1}{\sqrt{x^3-2x+2}}\,dx$ diverges by finding a simpler, smaller integral that diverges to positive infinity.

https://youtu.be/4zjp39ga-QM