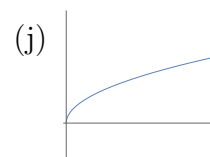
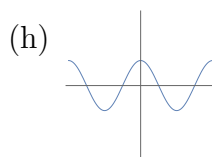
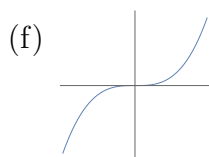
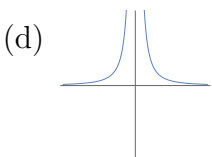
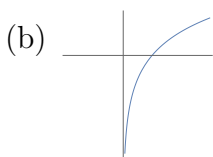
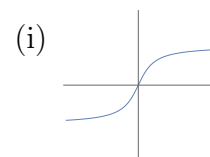
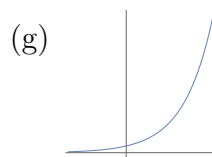
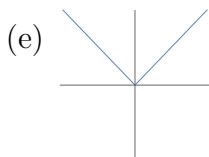
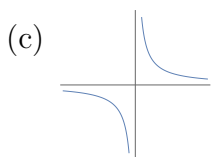
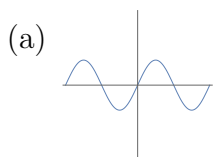


19 February 2019

1. **Warm Up:** Assign to each graph below its function.



x^3 $\cos(x)$ $\arctan(x)$ $|x|$ \sqrt{x} e^x $\ln(x)$ $1/x$ $\sin(x)$ $1/x^2$

2. Consider the integral $\int_1^\infty \frac{1}{x^p} dx$.

(a) Evaluate the integral for $p > 1$.

(b) Evaluate the integral for $p = 1$.

(c) Evaluate the integral for $p < 1$.

(d) What can you conclude about the finiteness of the integral, with respect to p ?

3. Use integration by parts to show that $\int_1^{\infty} \frac{\sin(t)}{\sqrt{t}} dt$ is finite.

Hint: For IBP, integrate $\sin(t)$ and differentiate $\frac{1}{\sqrt{t}}$. Then use $-1 \leq \cos(x) \leq 1$. Keep in mind the result of question 2. above.

4. Suppose f is continuous. Show that if $\int_1^{\infty} f(x) dx$ is infinite, then $\int_2^{\infty} f(x) dx$ is infinite.

5. Evaluate each of the following definite integrals.

(a) $\int_0^{\pi/2} \sin^2(3x) dx$

(d) $\int_0^{\pi^2} \sin(\sqrt{x}) dx$

(b) $\int_1^2 x\sqrt{x-1} dx$

(e) $\int_{-2}^2 (t+3)\sqrt{4-t^2} dt$

(c) $\int_0^{\ln(3)} x^2 e^{-x} dx$

(f) $\int_0^3 \frac{dx}{\sqrt{9+x^2}}$