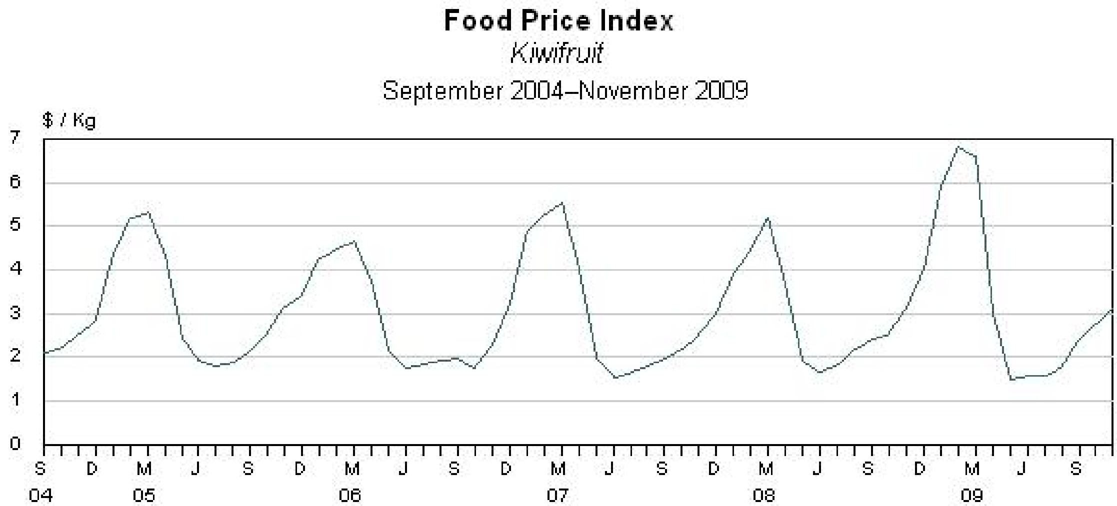
DISGUSTING WORKSHEET

1. What do you see? What function does it resemble to?



2. Compute the following integrals using u-substitution!

   - $\int \sin^3(x)\cos^4(x)dx$
   - $\int \sin^{100}(x)\cos^5(x)dx$ Hint: $\cos^2(x) = 1 - \sin^2(x)$
   - $\int \tan^3(x)\sec^{100}(x)dx$ Hint:$\frac{d}{dx}\sec(x) = \tan(x)\sec(x)$
   - $\int \tan^{100}(x)\sec^4(x)dx$ Hint: $\frac{d}{dx}\tan(x) = \sec^2(x)$ and $\tan^2(x)+1 = \sec^2(x)$.

3. Use the identities $\sin^2(x)+\cos^2(x) = 1$ and $\cos(2x) = 2\cos^2(x)-1 = 1-2\sin^2(x)$ to compute

   - $\int \sqrt{1+\cos(2x)}dx$ and $\int \sqrt{1-\cos 4x}dx$
   - $\int \cos^6(x)dx$
   - $\int \cos^4(x)dx$ and finally $\int \sin^2(x)\cos^2(x)dx$

4. Use the identity $\sin(mx)\sin(nx) = \frac{1}{2}(\cos(mx-nx) - \cos(mx+nx))$ to show that

$$\int_0^{2\pi} \sin(mx)\sin(nx)dx = 0$$

   if $|m|$ and $|n|$ are two different integers.

5. Calculate $\int \sec^4(x)dx$ (let $u = \sec^2(x)$ and $v' = \sec^2(x)$ and the identity $\sec^2(x) = \tan^2(x)+1$ to solve for $\int \sec^4(x)dx$). How can you use this to calculate $\int \tan^4(x)dx$.

—Turn the page—

6. Use trigonometric substitution to calculate the area of a disk of radius 1:
   - Consider the circle $x^2 + y^2 = 1$.
   - Show that the y-coordinate of the point(s) with x-coordinate x are $\pm\sqrt{1-x^2}$, thus the height of a slice is $2\sqrt{1-x^2}$.
   - Calculate $\int_{-1}^{1} 2\sqrt{1-x^2}dx$.
7. Compute the mass of the solid generated by revolving the region bounded by $y^2 = x^2 - 4$ and $x = 3$ about the y-axis if the density is given by $\delta = 1/x$.
8. Compute the arc length of the portion of the parabola $y = x^2$ for $0 \le x \le 4$.