## Math 1522: Review of Prerequisites

- R1. Diagnostic Test A (Stewart, p xxvi): 1,2,4,8(e,g),10
- R2. Sketch a graph of the following polynomials, solely using roots, symmetry, degree and sign of the leading coefficient.
  - (a)  $f(x) = (x^2 1)^3$

- (b)  $f(x) = x^3 cx, c > 0$
- (c)  $f(t) = 10t 1.86t^2$
- (d)  $v(r) = r_0 r^2 r^3, r_0 > 0$
- (e)  $F(r) = GMr/R^3$ , G, M, R > 0 (f) F(R) = GMr/R, G, M, r > 0
- R3. Evaluate the following limits:
  - (a)  $\lim_{x \to \infty} \frac{x^2 3x^3}{-4x^2 + x^3}$  (b)  $\lim_{x \to -\infty} \frac{x^2 3x^3}{-4x^2 + x^3}$
  - (c)  $\lim_{x \to \frac{\pi}{2}^+} \tan x$
- (d)  $\lim_{x \to \infty} \frac{\cos x}{x}$
- R4. Find all vertical asymptotes for  $f(x) = \frac{x-2}{x^2+x-6}$ . Show all work, including the limiting behaviour from both sides for each asymptote. Graph the function.
- R5. (a) State the defintion of continuity of f(x) at x = a
  - (b) State the defintion of the derivative of f(x) at x = a
  - (c) Use the definition to find f'(3) for f(x) = 1/x.
- R6. Find the derivatives of the following functions.
  - (a)  $f(x) = \sin(x^3)$
- (b)  $f(t) = \frac{1}{1 + 2t^2}$
- (c)  $F(x) = \int_0^x \frac{\sin t}{t} dt$ .

- (d)  $g(t) = \frac{1}{(1+t)^2}$
- (a)  $y = x^2 \sin(\pi x)$
- (b) F(R) = GMr/R

- (c)  $y = \int_{0}^{x} \frac{t}{1+t^3} dt$
- (d)  $y = \int_{1}^{x^4} \cos(t^2) dt$
- R7. Evaluate the following definite and indefinite integrals.
  - (a)  $\int \frac{1-x^2}{x^2} dx$
- (b)  $\int \frac{x^3}{1+x^4} dx$  (c)  $\int \frac{x^3}{1-x^2} dx$

- (d)  $\int_{1}^{9} \frac{\sqrt{u} 2u^{2}}{u} du$  (e)  $\int x(2x+5)^{8} dx$  (f)  $\int_{0}^{\pi/8} \sec(2\theta) \tan(2\theta) d\theta$  (g)  $\int_{0}^{3} |x^{2} 4| dx$  (h)  $\int_{-1}^{1} \frac{\sin x}{1 + x^{2}} dx$  (i)  $\int_{1}^{2} \frac{x}{(x+1)^{3}} dx$

- (j)  $\int \tan^2 \theta \sec^2 \theta \, d\theta$  (k)  $\int_0^t (t-s)^2 ds$
- R8. Evaluate (a)  $\int_{1}^{2} \frac{d}{dx} \left[ \frac{1}{1+x^{2}} \right] dx$ , (b)  $\frac{d}{dx} \left[ \int_{1}^{2} \frac{1}{1+x^{2}} dx \right]$ , (c)  $\frac{d}{dx} \left[ \int_{1}^{x} \frac{1}{1+t^{2}} dt \right]$ .
- R9. (a) Write down the linear approximation of a function f(x) at x = a.
  - (b) Find the linear approximation for  $f(x) = \sqrt{1+x}$  at a=0. Use it to approximate  $\sqrt{1.1}, \sqrt{0.9}$ .
  - (c) Find the linear approximation for  $f(x) = \sqrt{x}$  at a = 1.