1. Solutions to Midterm 2

(1) (a). $8x^3$
(b). $\frac{1}{2\sqrt{1-x^2}}$
(c). $\frac{1}{2\sqrt{x}} - \frac{1}{2x^{1.5}}$
(d). $3^x \ln(3) + \sec^2(x)$

(2) (a). $\frac{-\sin(x)\cos(\cos(x))}{\cos(\sin(x))} + \frac{\cos(x)\sin(\sin(x))\sin(\cos(x))}{(\cos(\sin(x)))^2}$
(b). $\frac{1}{x\ln(5)\ln(x)}$
(c). 0
(d). $-2xe^{-x^2}x^{e^2} + e^2x^{e^2-1}e^{-x^2}$

(3) Tangent Line $2ey = x + e$

(4) Absolute Maximum value 6; Absolute Minimum value -20.

(5) Rate of decrease is $0.01\,km/yr$

(6) The answer is a standard application of IVT & MVT. The interval for IVT can be, for example, $[0, 2\pi]$.

(7) Decreasing in the interval $(\frac{1}{1000}, e^{-1})$ & increasing in the interval $(e^{-1}, +\infty)$; local minimum at $x = e^{-1}$.