Name: Grading Guide

Each problem is worth 15 or 20 points. Work at least four of the first five problems and both of the last two problems; you may work all seven problems for extra credit. Numerical estimates are unacceptable; for full credit you must show all your work and use the indicated methods.

1. (15 pts) Find the slope the tangent line to $r = \theta^2$ when $\theta = \frac{\pi}{4}$.

−3 Doesn't sub $\theta = \pi/4$

−3 Uses degrees

−5 Gets basic setup right but doesn't take $x = r\cos\theta$, $y = r\sin\theta$

−2 Arithmetic / transcription error

−2 Reverses num & denom

−12 Takes derivative to be $r' = 2\theta = \pi/2$

−12 Gets $x = r\cos\theta$, $y = r\sin\theta$ but not much else

−10 Does something that looks vaguely like correct setup

2. (15 pts) Find

$$\frac{\mathrm{d}}{\mathrm{d}x}(\ln x)^{(\sqrt[5]{x})}$$

[redacted]

−12 Uses something like power rule – chain rule but no logarithmic diff'y, prod. rule, etc.

−4 Doesn't use chain rule in computing $\frac{d}{dx}\ln\ln x$

−1 Writes $\frac{d}{dx} =$

−14 Uses something that doesn't look like an application of chain, power, product, or anything else

−4 Does log diff but not mult.y

−3 Messes up chain rule in $\frac{d}{dx}\ln\ln x$

−4 Does log diff but messes up details on log props

3. (15 pts) Use local linear approximation to approximate the value of $\sqrt[3]{30}$. Perform all arithmetic by hand, and use a graph to illustrate whether your approximation is an overestimate or an underestimate.

−13 Does something like a difference quotient

−4 Doesn't substitute $x = 30$

−1 mislabels graph

−3 Uses $a = 8$

−3 Graph doesn't look like tangent line, but says overest.

−4 Gets $L(x)$ slightly wrong

−2 Says underest

−5 Uses a not a perfect cube

−6 Uses $a = 30$

−6 Gets a formula for $L(x)$ that looks only vaguely reminiscent of the correct one

4. (15 pts) Find the equation for the tangent line to the curve with parametric equations

$$x = \sqrt{t} - t$$
$$y = e^t$$

when $t = 4$.

-3 Doesn't sub $t = 4$

-7 Does $\frac{d}{dt}\frac{y}{x}$

-3 Gets $\frac{d}{dt}\{e^t, \sqrt{t} - t\}$ wrong

-2 Sign error

-4 Severe algebra

-4 Doesn't give line eqn

-1 ea Gets x or y coord wrong

-2 arithmetic

-2 Reverses num & denom

5. (15 pts) Find y' for

$$x^2 \sin\left(y^2\right) = 5xy$$

-1 transcription error

-3 minor alg

-3 ea Doesn't use chain rule where appropriate

-3 ea doesn't use product rule where appropriate

-4 doesn't solve for y'

-1 sign error

-4 major alg

-13 doesn't use implicit diff

6. (20 pts) Suppose a circular platform elevator is located directly below a spotlight and casts a shadow on the floor below. The height of the spotlight is 21 meters, the platform is 5 meters across, and its shadow is 15 meters across. If the shadow's diameter is currently shrinking at a rate of 1 m/s, find the current height of the elevator, determine whether the elevator is moving up or down, and find its speed. (Hint: draw a cross-section of the elevator with its shadow and use similar triangles.)

-8 Does implicit diff. on some halfway reasonable eqn but doesn't use similar triangles

-4 sign error on $\frac{dD}{dt}$

-3 Doesn't differentiate const. correctly

-3 Doesn't find current height

-9 Doesn't use sim. t.'s. or anything remotely reasonable

-9 No implicit diff

-2 Doesn't give $21-h$ for ht

7. (20 pts) The temperature T (in °F) of a 12" skillet over a gas flame is given as a function of the distance d (in inches) from the center of the skillet by

$$T(d) = -0.2d^3 - 1.5d^2 + 14.4d + 200$$

Find the maximum and minimum temperature of the skillet and where these temperatures occur.

−5 Doesn't show work on $T'(d) = 0 \Rightarrow d = -8, 3$

−1 minor alg.

−7 Doesn't test endpts (tests one −4)

−7 Doesn't find both g_{max}, g_{min}

−5 Doesn't throw out $d = -8$

−3 Thinks we're talking about a 2' skillet (her), so $dom\, T = [0, 12]$

−2 Calculates d wrong from correct derivative

−2 No units