

Question 1: Find an equation of the tangent line to the curve

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2$$

at the point $(0, 1/2)$.

[5]

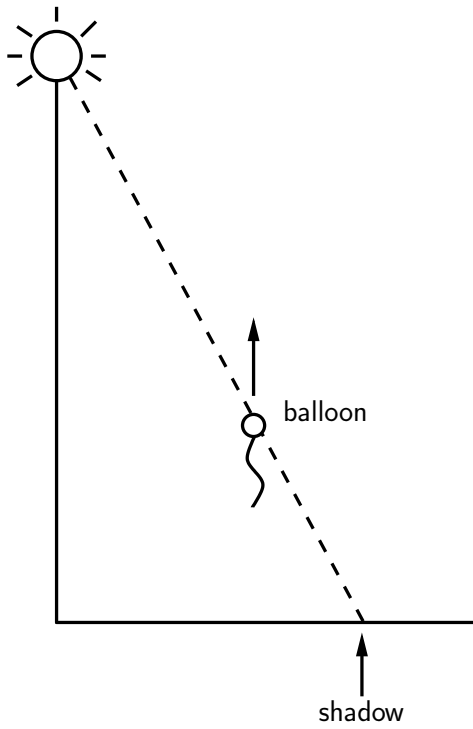
Question 2: Find y'' by implicit differentiation if

$$x^3 + y^3 = 1$$

Express your answer as a single simplified fraction involving the variables x and y only.

[5]

Question 3: A balloon is released from ground level 4 m from the base of a 12 m tall lamppost. As the balloon rises vertically it casts a shadow on the ground as a result of the light atop the lamppost. When the balloon is 3 m above the ground it is rising at 1 m/s. At what rate is the shadow moving along the ground at that same instant?



Question 4: Use a linear approximation to approximate $\sqrt{26}$.

[5]

Question 5: The circumference of a sphere was measured to be 100 cm with a possible measurement error of $1/2$ cm. Estimate the maximum error in the calculated surface area.
(Note: the surface area of a sphere of radius r is $S = 4\pi r^2$.)

[5]

Question 6:

(a) Find the domain of $f(x) = \frac{x}{1 - e^{x-2}}$

[3]

(b) Find the limit: $\lim_{x \rightarrow 3^-} e^{5/(3-x)}$

[3]

(c) Express as a single simplified logarithm:

$$\frac{1}{3} \ln(x+2)^3 + \frac{1}{2} [\ln x - \ln(x^2 + 3x + 2)^2]$$

[4]

Question 7: Find the following derivatives (it is not necessary to simplify your answers):

(a) $y = \sqrt{1 + 2e^{3x}}$

[2]

(b) $f(x) = 10^{1-x^2}$

[2]

(c) $y = x^2 \ln(2x + 1)$

[3]

(d) $g(t) = [\ln(1 + e^{3t})]^2$

[3]