Name: KW

Show your work. Answers without work earn reduced credit.

- 1. [2 parts, 1 point each] Let C(q) represent the cost and R(q) represent the revenue, in dollars, of producing q items.
 - (a) If C(50) = 2340 and C'(50) = 14, estimate C(52).

$$C(52) \approx 2340 + 2.14 = |$2368|$$

(b) If C'(50) = 20 and R'(50) = 26, estimate the profit that the company earns from the 51^{st} item.

- 2. [4 parts, 1 point each] Differentiate the following functions.
 - (a) $y = 5x^3$

$$\begin{cases} 4 & 5x^3 \end{bmatrix} = 5 & x^3 \end{bmatrix} = 15x^2$$

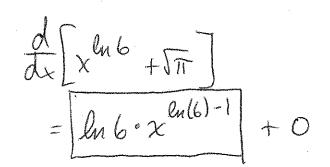
(b)
$$y = \frac{1}{t^4}$$

$$\frac{d}{dt} \left[\frac{1}{t^4} \right] = \frac{d}{dt} \left[\frac{1}{t^4} \right] = -4t^{-5} = \left[-\frac{4}{t^5} \right]$$

(c)
$$f(r) = \sqrt{r(r+1)}$$

$$\frac{\partial}{\partial r} \left[\sqrt{r(r+1)} \right] = \frac{\partial}{\partial r} \left[r^{3/2} + r^{1/2} \right]$$

(d)
$$y = x^{\ln 6} + \sqrt{\pi}$$



$$= \frac{3}{2} \int_{-\frac{1}{2}}^{\frac{1}{2}} + \frac{1}{2} \int_{-\frac{1}{2}}^{\frac{1}{2}}$$

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3. [1 point] Find the equation of the tangent line to the curve $f(t) = t^2 - 3t + 1$ at t = 2. $(x - x_1)$

$$f'(t)=2t-3$$

 $M=f'(2)=4-3=1$
 $x_1=2$
 $y_1=2^2-3\cdot 2+1=4-6+1=-1$

$$-3t+1 \text{ at } t=2.$$

$$Y-Y_1 = M(x-X_1)$$

$$Y-(-1)=1(x-2)$$

$$Y=x-3$$

$$Y=x-3$$

4. [3 parts, 1 point each] Differentiate the following functions.

(a)
$$f(x) = 2e^x + x^2$$

$$\frac{d}{dx}\left[2e^{x}+x^{2}\right] = \frac{d}{dx}\left[2e^{x}\right] + \frac{d}{dx}\left[x^{2}\right]$$

$$= \left[2e^{x}+2x\right]$$

(b)
$$y = 2^t + e^{3x^2}$$

$$\frac{de}{dt}\left[2^{t}+e^{3et}\right] = \frac{d}{dt}\left[2^{t}\right] + \frac{d}{dt}\left[e^{3t}\right]$$

$$= \left[\ln(2)\cdot 2^{t} + 3e^{3t}\right]$$

(c)
$$g(s) = 4 \cdot e^{0.5s} + \ln(s)$$

$$\frac{d}{ds} \left[4 \cdot e^{0.5s} + \ln(s) \right] = \frac{d}{ds} \left[4 \cdot e^{0.5s} \right] + \frac{d}{ds} \left[\ln(s) \right]$$

$$= 4(0.5) e^{0.5s} + \frac{1}{5}$$

$$= 2e^{0.5s} + \frac{1}{5}$$