MAT 125 Summer II 2006

Practice Final

The final exam will similar in both form and content to this practice exam.
Solutions will appear on the course webpage.

1. Circle "true" or "false":

(a) If $f(x)$ is continuous on the open interval (a, b), then $f(x)$ has an abolute maximum in the interval (a, b)

TRUE FALSE

(b) If $g(x)$ has a local maximum at $x = 3$ then $g'(3) = 0$

TRUE FALSE

(c) If $f(x)$ is a differenentiable function, then $\frac{d}{dx} ln(f(x)) = \frac{f'(x)}{f(x)}$

TRUE FALSE

(d) If $h(x)$ is differentiable on the interval $[1, 2]$, $h(1) = 3$ and $h(2) = 5$, then for some number c between 3 and 4, $h'(c) = 2$

TRUE FALSE

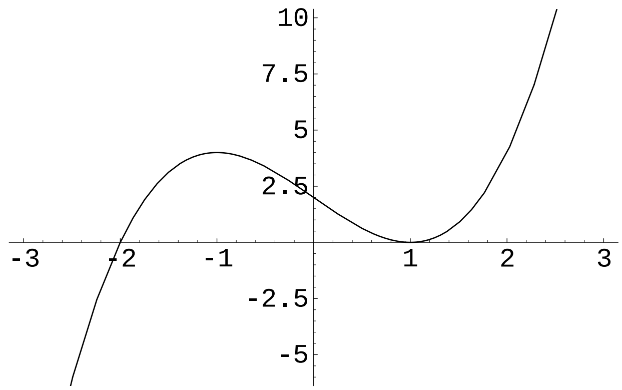
(d) If $\lim_{h \to 0} \frac{f(3+h)-f(3)}{h} = 17$, then $f(x)$ is continuous at $x = 3$

TRUE FALSE

(e) If $f'(x)$ is increasing, then $f(x)$ is positive.

TRUE FALSE

2. Here is a graph of $f'(x)$, the **derivative** of $f(x)$. Decide whether the following statements about $f(x)$ are true or false:



(a) $f(x)$ has a local maximum at $x = -1$

TRUE FALSE

(b) $f(x)$ has a local minimum at $x = -2$

TRUE FALSE

(c) $f(x)$ is increasing on the interval $(-2, \infty)$

TRUE FALSE

(d) $f(x)$ is concave up on the interval $(-1, 1)$

TRUE FALSE

(e) $f(x)$ has an inflection point at $x = 1$

TRUE FALSE

3. Compute the following limits. If a limit does not exist, write "$+\infty$", "$-\infty$", or "DNE" as appropriate. Do not write "undefined", because I won't know what you mean.

(a) $\lim_{x \to \frac{\pi}{2}} e^{\sin x}$

(b) $\lim_{x \to 3} \frac{x-3}{x^2-9}$

(c) $\lim_{h \to 0} \frac{\sqrt{h^2+1}-1}{h}$

(d) $\lim_{x \to \infty} sin(x)$

(e) $\lim_{t \to \infty} \frac{x-x^3}{3x^2+2x-1}$

4. Differentiate the following funtions with respect to x.

(a) $7x^7 - 6x^6$

(b) $cos(2x)$

(c) xe^{3x}

(d) $\frac{ln(x)}{x}$

(e) $\sqrt{1+x^2}$

(f) $sec(x^2)$

5. Find $\frac{dy}{dx}$ in each of the following problems:

(a) $y = e^{2x} cos(\sqrt{7x^2 - 3x})$

(b) $xy^3 - yx^3 = sin(xy)$ (Hint: Use implicit differentiation)

(c) $y = x^{sin(x)}$ (Hint: Use logarithmic differentiation)

6. Let $f(x) = \sqrt{x}$

(a) Find the equation of the tangent line to $f(x)$ at $x = 4$

(b) Use your from part (a) to approximate $\sqrt{3.9}$

7. Consider $g(x) = \frac{x^4}{4} + x^3 - 2x^2$

(a) List the local maxima of $g(x)$

(b) List the local minima of $g(x)$

(c) Find the absolute maximum and minimum values of $g(x)$ on the interval $[0, 2]$

(d) List the inflection points of $g(x)$

(e) Where is $g(x)$ concave up?

8. As Santa Claus attempts to descend a chimney, Rudolph heatbutts him and knocks him off the roof. Santa's position as he falls is described by:

$$s(x) = 32 - 16t - 16t^2$$

where $s(x)$ is Santa's height in feet and t is time in seconds.

(a) Give a formula for Santa's velocity as a function of time.

(b) How fast is Santa falling when he hits the ground?